**EAS 41300/A1300 Environmental Geochemistry**

**Spring 2018**

**Instructor**: Dr. Pengfei Zhang, MR-932, 212-650-5609, pzhang@ccny.cuny.edu

**Time**: Mon, Wed, 12:30 – 1:45 pm; **Location**: MR044; **Office hours**: Mon, 10am – noon

**Description**:

This course will focus on key principles of aqueous geochemistry and main controls on the chemistry of pristine and polluted soil, surface and ground water environments, with a system science approach. Topics include chemical thermodynamics and kinetics; acid-base reactions, oxidation-reduction reactions, ion exchange and other surface reactions; geochemistry of clay minerals, colloids, and soils; isotope geochemistry; geochemical cycles of carbon, nitrogen, and sulfur; water pollution and water treatment.

**Objectives:**

At the completion of this course, students should have:

(1) a deep understanding of basic reactions in aqueous geochemistry;

(2) knowledge of geochemical cycles of matter; and

(3) a good understanding of the nature and types of water pollutants

**Prerequisite:**

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EAS 10600 or EAS 21300; EAS 217; Physics 204 or 208 or Chemistry 104 or equivalent, or by permission

**Required Textbook**:

Faure, G., Principles and Applications of Geochemistry, 2nd Ed., 1998, Prentice Hall

**Other Useful Texts**:

Drever, J.I., The Geochemistry of Natural Waters, 3rd Ed., 1997, Prentice Hall

Langmuir, D., Aqueous Environmental Geochemistry, 1997, Prentice Hall

Stumm, W. and Morgan, J.J., Aquatic Chemistry, 3rd Ed., 1996, Wiley

Manahan, S.E., Environmental Chemistry, 9th Ed., 2010, CRC Press

**Grading**:

Exams: 300 points (100 points for midterm and 200 points for final)

Problem sets: 180 points (7 homework + 2 labs, 20 points each)

Term paper (graduate students only): 100 points. Graduate students will prepare a term paper that critically reviews a topic in environmental, aqueous, or isotope geochemistry. Details will be provided in class early in the semester.

Attendance and participation: 40 points

Total: 520 points for undergraduate students and 620 points for graduate students

Extra points: 5 points for each seminar attended (with a one-page summary), for a maximum of 20 points (4 seminars). Seminars will be announced on Blackboard.

Grading scale: A: ≥93%, A-: 90-92%, B+: 87-89%, B: 84-86%, B-: 80-83%, C+: 77-79%, C: 74-76%, C-: 70-73%, D: 60-69%, F: <60%

**Course policy:**

Homework and reports will be due at the beginning of class on the specified due date. No late homework or reports will be accepted. Attendance is required, and 10 points will be deducted for each missed lecture. Any student who misses more than four classes will be dropped from the course. The CCNY policy on academic integrity will be strictly followed.

**Assessment Tools**

(1) Homework Assignments; (2) Exams; and (3) End of Course Survey

**Schedule:**

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| **Date** | **Lecture Topics** | **Reading** |
| Jan. 29 | Introduction |  |
| Jan. 31, Feb. 5 | Principles of inorganic chemistry | Ch. 5, 6, 7 |
| Feb. 7, 14 | Chemical thermodynamics  | Ch. 11, handout |
| **Feb. 12, 19** | **No class, Holiday** |  |
| Feb. **20**, 21, 26 | Chemical kinetics | Ch. 15.1, handout |
| Feb. 28 | Introduction to aquatic chemistry | Handout |
| Mar. 5, 7 | Water quality lab (**Room 043**) | Handout |
| Mar. 12, 14 | Acids and bases | Ch. 9 |
| Mar. 19, 21 | Carbonate chemistry, solubility of salts | Ch. 10, handout |
| Mar. 26 | Homework review |  |
| **Mar. 28** | **Mid-term** |  |
| **Mar. 30-Apr. 8** | **Spring recess** |  |
| Apr. 9, 23 | Oxidation-reduction reactions | Ch. 14 |
| **Apr. 11** | **No class, Friday schedule** |  |
| Apr. 16, 18 | Sorption, sorption lab (**Room 043**) | Handout |
| Apr. 25 | Clays | Ch. 13 |
| Apr. 30 | Colloids | Ch. 13, handout |
| May 2 | Weathering and soils | Ch. 19, 21 |
| May 7, 9 | Biogeochemical cycles | Ch. 22, handout |
| May 14 | Homework review |  |
| May 16 | Graduate student presentations, reports due |  |
| **May 23** | **Final, 10:30-12:45PM** |  |

**The instructor reserves the right to modify this syllabus during the semester.**