

**EVSC610/ENE663 Water Chemistry**  
*Spring 2023 Course Syllabus*

**NJIT Academic Integrity Code:** All Students should be aware that the Department of Chemistry & Environmental Science (CES) takes the University Code on Academic Integrity at NJIT very seriously and enforces it strictly. This means that there must not be any forms of plagiarism, i.e., copying of homework, class projects, or lab assignments, or any form of cheating in quizzes and exams. Under the University Code on Academic Integrity, students are obligated to report any such activities to the Instructor.

**COURSE INFORMATION**

**Course Description:** This course will cover acid-base and metal-ligand equilibria, oxidation-reduction reactions, and chemical reaction kinetics and thermodynamics. There is some emphasis on equilibria governing inter-phase (gas-liquid, solid-liquid) chemical distribution. Mathematical approaches to prediction of equilibrium chemical speciation are stressed.

**Course Objectives and Student Learning Outcomes:**

**Learning Outcomes:** By the end of this course,

- 1) Students will understand with the equilibrium reactions in close and open systems, the interaction between different phases (liquid, gas and solid), and the redox reactions in environmental systems.
- 2) Students will learn to predict the chemical composition, pH and redox condition of an aquatic system
- 3) Students will develop the tools to solve problems with complex chemical reactions in natural and engineer systems

**Number of Credits:** 3

**Course-Section and Instructors**

| Section         | Location | Instructor  |
|-----------------|----------|-------------|
| R 6pm – 8:50 pm | CKB120   | Lijie Zhang |

**Office Hours:** By appointment. Emails requesting a meeting should be sent to [lijie.zhang@njit.edu](mailto:lijie.zhang@njit.edu).

**Required Textbook:**

|                  |                     |
|------------------|---------------------|
| <b>Title</b>     | Water Chemistry     |
| <b>Author</b>    | Mark M. Benjamin    |
| <b>Edition</b>   | 2 <sup>nd</sup>     |
| <b>Publisher</b> | Waveland Press, Inc |
| <b>ISBN#</b>     | 978-1-4786-2308-3   |

**Canvas:** There is a course Canvas site that will include significant resources and updates of importance to this course. Please check it frequently, and also make sure to check or forward your NJIT email in order to receive important announcements.

**Grading Policy:** The final grade in this course will be determined as follows:

|                            |    |
|----------------------------|----|
| <b>Class participation</b> | 5  |
| <b>Homework</b>            | 20 |
| <b>Class Project</b>       | 20 |
| <b>Midterm Exam</b>        | 25 |
| <b>Final Exam</b>          | 30 |

Your final letter grade in this course will be based on the following tentative curve:

|           |     |          |     |
|-----------|-----|----------|-----|
| <b>A</b>  | 90+ | <b>C</b> | 70+ |
| <b>B+</b> | 85+ | <b>D</b> | 60+ |
| <b>B</b>  | 80+ | <b>F</b> | <60 |
| <b>C+</b> | 75+ |          |     |

**Attendance:** Attendance is mandatory. Students who miss class due to a valid personal or medical reason must contact the Dean of Students office with the valid excuse and get the excuse approved. The Dean of Students will then contact me and any other professors whose classes were missed. Missed worksheets, quizzes, or exams without a Dean of Students approved excuse will result in a zero grade. The instructor does not approve excuses of any sort. Students walking out of class early or low attendance early in a class may result in a roll call being taken and loss of points.

**Homework:** Homework assignments must be completed and submitted Canvas on the date specified by the instructor.

**Exams:** Exams are **open-book** and **open-note**. There will be a midterm exam and a final exam, and the final exam will cover all materials throughout the semester. Normally **NO MAKE-UP EXAMS** are allowed during the semester. In the event that a student has a legitimate reason for missing an exam, the student should contact the Dean of Students office and present written verifiable proof of the reason for missing the exam, e.g., a doctor's note, police report, court notice, etc. clearly stating the date AND time of the mitigating problem. The student must also notify the CES Department Office/Instructor prior to the exam that the exam will be missed so that appropriate steps can be taken to make up the grade.

**Class Project:** 3-4 students will form a group and work together on a term paper. Students are encouraged to consult with the instructor about term paper topic. The term paper needs to be at least 5 pages (font 12, 1.15× spaced) in length excluding figures and references, though inclusion of figures and tables is recommended to facilitate the delineation. For the presentation, please plan your talk for about 15 minutes, leaving 5 minutes for questions and discussions. Both paper and presentation are weighed equally for grading.

## **ADDITIONAL RESOURCES**

**Accommodation of Disabilities:** Office of Accessibility Resources and Services (*formerly known as Disability Support Services*) offers long term and temporary accommodations for undergraduate, graduate and visiting students at NJIT.

If you are in need of accommodations due to a disability please contact Chantonette Lyles, Associate

Director at the Office of Accessibility Resources and Services at 973-596-5417 or via email at [lyles@njit.edu](mailto:lyles@njit.edu). The office is located in Fenster Hall Room 260. A Letter of Accommodation Eligibility from the Office of Accessibility Resources Services office authorizing your accommodations will be required.

For further information regarding self-identification, the submission of medical documentation and additional support services provided please visit the Accessibility Resources and Services (OARS) website at:

<http://www5.njit.edu/studentssuccess/disability-support-services/>

### Tentative Course Outline

| Week | Date    | Topic   | Readings               |
|------|---------|---|------------------------|
| 1    | Jan. 19 | Introduction, general chemistry concepts, chemical reactivity                       | Chapter 1<br>Chapter 2 |
| 2    | Jan. 26 | Reaction Kinetics ( <i>Term project group formed</i> )                              | Chapter 3              |
| 3    | Feb. 2  | Reaction thermodynamic and equilibrium  | Chapter 2<br>Chapter 4 |
| 4    | Feb. 9  | Introduction to acid-base chemistry ( <i>Term project Title and Objective due</i> ) | Chapter 5              |
| 5    | Feb. 16 | Graphical solutions for acid-base chemistry   | Chapter 6              |
| 6    | Feb. 23 | Chemical equilibrium software<br>Titrations and buffers                             | Chapter 7<br>Chapter 8 |
| 7    | Mar. 2  | Titrations and buffers  | Chapter 8              |
| 8    | Mar. 9  | <b>Midterm Exam</b>   |                        |
| 9    | Mar. 16 | <b>Spring Break (No Class)</b>  |                        |
| 10   | Mar. 23 | Gas-liquid equilibrium  | Chapter 9              |
| 11   | Mar. 30 | Chemistry of metals in aqueous solutions: solution phase reactions                  | Chapter 10             |
| 12   | Apr. 6  | Precipitation and dissolution reactions ( <i>Term paper first draft due</i> )       | Chapter 11             |
| 13   | Apr. 13 | Redox chemistry 1   | Chapter 12             |
| 14   | Apr. 20 | Redox chemistry 2   | Chapter 12             |
| 15   | Apr. 27 | Student presentations ( <i>Term paper due</i> )                                     |                        |
| 16   | TBD     | <b>Final Exam</b>   |                        |