SCBE 220 Principles of Water Chemistry 3 (3-0-6)
วททส ๒๒๐ หลักการทางเคมีของน้ำ

Course Coordinator: Toemthip Poolpak, Ph.D

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Course Description

Concepts of chemical kinetics and equilibrium processes will be reinforced through experiments in titrimetric analyses, determinations of Ka and Ksp values, investigation of rate constants and reaction orders, buffer preparations, oxidation/reduction reactions and qualitative analyses. Units, reactions, activities, and equilibrium of aquatic systems, entropy, thermodynamics, and activation energy. Weak acid equilibrium, constructing and using log C-pH diagrams, solving aquatic equilibria. Components and mole balance equations. Alkalinity and the pH of natural waters, electrochemistry and redox equilibrium, Eh-pH diagrams, redox conditions of natural waters, open systems and equilibrium with the gas phase. Metals in aquatic systems, precipitation and dissolution reactions and analysis by atomic absorption spectroscopy and UV-visible spectroscopy; metal adsorption isotherms and surface complexation modeling; biogeochemistry and microbial control of metal.

Grading and evaluations

Grading for the SCBE220 course is based on several pieces of works. These include class attendance, assignments, midterm and final exams, a general evaluation from the lecturing staff.

Course Outline

Class is on Friday 9.30-12.30 (3 hrs): Phayathai Campus

Week	Date	Topics	instructor
1	Aug 7	1 Introduction to Water Chemistry	PP
2	Aug 14	2 Fundamentals of Aquatic Chemistry: gases, oxygen and carbon dioxide in water	PP

3	Aug 21	3 Acid, Base and Salts; Acid-Base, Buffer and Buffer capacity	PP
4	Aug 28	4 Weak Monoprotic Acids, Weak Polyprotic Acids, Titration Curve; Environmental Water Buffers, Open and Closed Systems	PP
5	Sep 4	5 Alkalinity and hardness; calcium and other mineral in water; complexation and chelation; solubilization of lead; phosphate in water	PP
6	Sep 11	6 Electron Activity, pH and pKa	PP
7	Sep 18	7 Oxidation–Reduction in Aquatic Chemistry; Whole Reaction; Half-Reactions; Chemical Interactions: flocculation	PP
8	Sep 25	8 Phase Interactions in Chemical Fate and Transport: Rivers, Lakes and Reservoirs; Exchange with the Atmosphere, Exchange with Sediments; Aquatic Biochemical Processes; Zero-Order, First-order and Second-order rate reaction; Reaction Kinetics in Soil-Water Systems; Langmuir and Freundlich Isotherms	PP
9	Oct 2	Midterm examination	
10	Oct 9	9 Aquatic Microbial Biochemistry	TP
11	Oct 16	10 Microbial Oxidation and Reduction I	TP
12	Oct 30	11 Microbial Oxidation and Reduction II	TP
13	Nov 6	12 Microbial Transformations of Nitrogen	TP
14	Nov 13	13 Organic and inorganic compounds, xenobiotic and emerging pollutants in water	TP
16	Nov 20	15 Biosorption of inorganic chemicals	TP
17	**December**	**Final Exam**	TP

References

Sawyer, C. And Mc Carty, P. And Parkin, G. 2003 Chemistry for Environmental Engineering and Science. McGraw-Hill Education, 5th Edition, New York, N.Y.

Manahan, S. 2017 Water Chemistry. CRC Press, FL

Manahan, S. 2022 Environmental Chemistry, 11th Eds, CRC Press, FL

Teaching and Evaluation Methods

Teaching will be in the classroom with interacting perspectives. A textbook is required and course content will follow the recommended textbook.

Midterm and final examinations are in a written format and will be announce at the beginning of the class or with this course outline.

Evaluation

1. Mid-term examination	40%
2. Final examination	35%
3. Attendance and quiz	15%
4. Presentation	10%

Students will be evaluated from their total score (out of 100%). Grading system is A, B+, B, C+, C, D+, D and F.