OCES 2002 Marine Chemistry
Spring 2025
3 credits

1. **Instructors**

Prof. Jiying LI (JL), Course coordinator
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2. **Teaching Assistants**

Ms. Xiaotian Zhou (XZ),
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Mr. Yuxuan LIN (YL),
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3. **Time and Location:**
Monday and Wednesday 12:00 PM – 1:20 PM
Room: Rm 4502, Lift 25-26

4. **Office hours**
   1) Students can contact TA(s) and instructors by (1) posting questions and comments on Canvas Discussions for whole class interactions [preferred method] or
   2) Sending private questions via emails or as Canvas messages.
   3) Meet with Prof. Li every Friday 10:00 am- 12:00 pm at CYT 2012

5. **Course Description**
Credits: 3
Pre-requisite: CHEM 1030
Brief description: This course describes the chemistry of the ocean based on distributions and dynamics of elements, atoms and molecules. This ranges from fundamental physical, thermodynamic and kinetic chemistry to interactions of ocean chemistry with biological, geological and physical processes. It encompasses both inorganic and organic chemistry, and includes studies of ocean-atmosphere dynamics and marine sediments.

6. **Intended Learning Outcome**
On successful completion of this course, students are expected to be able to:
   - Understand the basic physical and chemical properties of water in seawater.
   - Understand the sources, distribution, speciation, and cycling of major and trace elements in marine waters including inorganic nutrients, dissolved organic matter, gases, and trace elements in the oceans.
   - Understand the physical, chemical and biological processes affecting the variations in the ocean's chemical environment.

7. **Assessment and Grading**
This course will be assessed using criterion-referencing and grades will not be assigned using a curve. Detailed rubrics for each assignment are provided below, outlining the criteria used for evaluation:

- Class participation: 20%, including attending classes, taking in-class quizzes, and participating in in-class discussions.
- Problem assignments: 7 assignments in total; 40%;
- Mid-term exam (closed book): 15 %
- Final exam (open book): 25%

Detailed rubrics for each assignment will be provided after the grades are released. Assessment marks for individual assessed tasks will be communicated via Canvas within two weeks of submission. Students who have further questions about the feedback including marks should consult the instructor within five working days after the feedback is received.

Final Grade Descriptors:

Grades	Short Description	Elaboration on subject grading description
A	Excellent Performance	Demonstrates a comprehensive grasp of subject matter, expertise in problem-solving, and significant creativity in thinking.
B	Good Performance	Shows good knowledge and understanding of the main subject matter, competence in problem-solving, and the ability to analyze and evaluate issues.
C	Satisfactory Performance	Possesses adequate knowledge of core subject matter, competence in dealing with familiar problems, and some capacity for analysis and critical thinking.
D	Marginal Pass	Has threshold knowledge of core subject matter, potential to achieve key professional skills, and the ability to make basic judgments. Benefits from the course and has the potential to develop in the discipline
F	Fail	Demonstrates insufficient understanding of the subject matter and lacks the necessary problem-solving skills. Shows limited ability to think critically or analytically and exhibits minimal effort towards achieving learning goals. Does not meet the threshold requirements for professional practice or development in the discipline.

8. The course policy on the use of generative AI.

The use of Generative Artificial Intelligence tools (AI) in assignments is permitted with proper acknowledgment. Students are responsible for contents produced by AI tools and required to disclose how AI is used in generating the content, except for using AI to correct grammatical errors and improve the clarity of text they composed.

9. Student Learning Resources:

Primary textbook(s):

- Pilson, M. E. Q (2013) An Introduction to the Chemistry of the Sea. Second Edition. Cambridge University Press, New York, 521 p. [**P**]
  Library access: Physical copy reserved in library
- Libes, S.M. (2009) *Introduction to marine biogeochemistry*. Second Edition. Academic Press, Boston, 928 p. [**L**]
  Library access: https://lbdiscover.ust.hk/bib/991012845169703412

Additional textbook(s):

- Emerson, S. and Hedges, J. (2008) *Chemical oceanography and the marine carbon cycle.* Cambridge University Press, Cambridge, 475 p. [**E&H**]
  Library access: https://lbdiscover.ust.hk/bib/991012846066003412

10. Academic Integrity

Students are expected to adhere to the university's academic integrity policy. Students are expected to uphold HKUST's Academic Honor Code and to maintain the highest standards of academic integrity. The University has zero tolerance of academic misconduct. Please refer to Academic

Integrity | HKUST – Academic Registry for the University's definition of plagiarism and ways to avoid cheating and plagiarism.

11.Course Schedule:

Wk	Date	Topic	Reference	Instructor	TA
1	3 Feb	Introduction to marine chemistry	P Ch.1, L Ch.1		
	5 Feb	The properties of water in seawater	P Ch.2-3, L Ch.2,3.3		
2	10 Feb	Major elements and mass balance	P Ch.4, L Ch.3.4-4	AW	
	12 Feb	Dissolved gases and air-sea exchanges	P Ch.5, L Ch.6		
3	17 Feb	The carbonate system: calcite, alkalinity and pH	P Ch. 7		
	19 Feb	Ionic interactions	L Ch.5.6		
4	24 Feb	Chemical equilibrium in seawater	E&J Ch. 3, L Ch 5.5		
	26 Feb	Acids and bases in seawater (I);	L Ch.5.8		
5	3 Mar	Acids and bases in seawater (II);	L Ch.5.8		
	5 Mar	Metal complexation (I)	L Ch.5.7-5.8		
6	10 Mar	Metal complexation (II)	L Ch.5.7-5.8		
	12 Mar	Solubility, dissolution and precipitation;	P Ch. 6		
7	17 Mar	General ion speciation in seawater;	L Ch.5.8		
	19 Mar	Midterm Review			XZ
8	24 Mar	***Mid-term Exam***			YL
	26 Mar	Redox chemistry of seawaters (I)	L Ch. 7.2, 7.3		
9	31 Mar	Redox chemistry of seawaters (II)	L Ch. 7.2, 7.3	JL	
	2 Apr	*Midterm Break*			
10	7Apr	Nutrients and primary productivity (I)	L Ch.9-10, L Ch.11		
	9 Apr	Nutrients and primary productivity (II)	L Ch.9-10, L Ch.11		
11	14 Apr	Marine carbon cycle	P Ch. 11, L Ch. 23, 25		
	16 Apr	Ocean deoxygenation and anoxic environment	L Ch.12		
12	21 Apr	*Holiday*			
	23 Apr	Marine phosphorus cycle	P Ch. 8.1		
13	28 Apr	Marine nitrogen cycle	P Ch. 8.2 P Ch 9,		
	30 Apr	Marine silica cycle and trace metals	P Ch 8.3-8.5,L Ch. 16		
14	5 May	*Holiday*			
	7 May	Final Review			