The Hong Kong University of Science and Technology
UG Course Syllabus

[Marine Toxicology]
[OCES 4320]
[3 credits]

Instructors:

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Class Time:

Tuesdays 10:30-11:50 am
Thursdays 10:30-11:50 am

Location: Classroom 5560 (Lift 27-28)

Course Description

This course aims to provide students with a science background to understand toxicology within the scope of marine environments. It is focused on modern principles of marine ecotoxicology, covering topics from main classes of traditional and emerging contaminants in the ocean to their toxicological implications on various biotic components and marine ecosystem health. It will also introduce new and advanced technologies for understanding ecotoxicology in the marine environment.

Intended Learning Outcome

On successful completion of this course, the students are expected to be able to:

- demonstrate fundamental understanding of concepts such as biotransformation, bioaccumulation, toxicity, and trophic transfer
- describe how foreign substances can cause damage at different levels: from molecules to ecosystems
- describe biotransformation and bioaccumulation of foreign substances in cells
- understand the sources and the movement of contaminants in the environment
- identify and describe different scientific methods to critically evaluate complex, emerging environmental pollutants at global and local scales
- address challenges in marine toxicology by integrating scientific knowledge, technical applications, and innovative technology
- apply the knowledge in daily life to contribute to marine environmental protection.

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.

Assessment Task	Contribution to Overall Course grade (%)	Due date
Class participation (including attending classes, taking in-class quizzes, etc.)	30%	N/A
Mid-term exam	35%	19/03/2025
Final examination	35%	Refer to the exam timetable

Mapping of Course ILOs to Assessment Tasks

Assessed Task	Mapped ILOs	Explanation
Class participation (including attending classes, taking in-class quizzes, etc.)	ILO1 – ILO7	In class, we will interact with the students to help them understand the modern principles of marine ecotoxicology and achieve the learning outcomes.
Mid-term exam	ILO1-ILO3, ILO7	The first half of the course will primarily focus on the basics of toxicology, and the mid-term exam is designed assess students' ability to model the biotransformation, bioaccumulation, toxicity, and trophic transfer of toxic substances in the organisms and ecosystem (ILO1-ILO3) and then apply the knowledge to daily life to contribute to marine environment protection (ILO7).
Final examination	ILO4-ILO7	The second half of the course will focus on the advances in both technology and applications in marine toxicology. The final exam will be designed to assess if the students understand the sources and the movement of contaminants in the environment (ILO4); can describe different scientific methods to critically evaluate complex, emerging environmental pollutants and address challenges in marine toxicology by integrating scientific knowledge, technical applications, and innovative technology (ILO5-6), eventually know how to apply the knowledge in daily life to contribute to marine environmental protection (ILO7).

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. Exhibits a high capacity for collaboration and participation in discussion, going beyond core requirements to achieve learning goals.
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. Displays high motivation to learn and the ability to work effectively with others.
C	Satisfactory Performance	Possesses adequate knowledge of core subject matter, competence in dealing with familiar problems, and some capacity for analysis and critical thinking. Shows persistence and effort to achieve broadly defined learning goals.
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.

Student Learning Resources

Primary Reference textbook(s):

Julián Blasco, Peter M Chapman, Olivia Campana, Miriam Hampel (2016), Marine ecotoxicology: Current knowledge and future issues, ISBN: 0128033711
https://lbdiscover.hkust.edu.hk/bib/cdi_askewsholts_vlebooks_9780128033722

Michael C. Newman, Fundamentals of ecotoxicology: The science of pollution, Fifth Edition.
https://lbdiscover.hkust.edu.hk/bib/991013142459003412

Supplementary materials: A range of reading and web resources will be made available on Canvas (canvas.ust.hk) prior to each lecture.

Course AI Policy

[Generative artificial intelligence tools are encouraged to be used in-class discussion and assignments, but not for completing assessment tasks for the mid-term and final exams.]

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.

Lecture topics and schedule

Wk	Date	Topic	Reference	Instructor
1	1 Feb	Introduction to Marine Toxicology		JZ
	6 Feb	Pollutants in the marine environment (overview)		JZ
2	8 Feb	Uptake, Biotransformation & Detoxification		JZ
	13 Feb	*Holiday break*		
3	15 Feb	Bioaccumulation and biomagnification		JZ
	20 Feb	Factors Influencing Bioaccumulation and Trophic transfer		JZ
4	22 Feb	Toxicity effects I: Biochemical mechanisms		JZ
	27 Feb	Toxicity effects II: Physiological effects of pollutants		JZ
5	29 Feb	Toxicity effects III: Changes in communities and ecosystems		JZ
	5 Mar	Evaluation of toxicity I: Saltwater Toxicity Tests		JZ
6	7 Mar	Evaluation of toxicity II: Sediment Toxicity Testing		JZ
	12 Mar	Evaluation of toxicity III: Mesocosm and Field Toxicity Testing		JZ
7	14 Mar	Evaluation of toxicity IV: Biomarkers		JZ
	19 Mar	*Mid-term Exam*		JZ
8	21 Mar	Source of contaminants and routes by which they enter ecosystem		OH
	26 Mar	Movements and global transport of pollutants in the marine environment (I)		OH
9	9 Apr	Movements and global transport of pollutants in the marine environment (II)		OH
	11 Apr	Introduction to organic pollutants		OH
10	16 Apr	Emerging new contaminants in the marine environment		OH
	18 Apr	Traditional methods to characterize organic pollutants		OH
11	23Apr	Advanced methods to characterize organic pollutants		OH
	25 Apr	Introduction to microplastics (I): Definition & history		OH
12	30 Apr	Introduction to microplastics (II): Great Bay Area		OH
	2 May	New techniques in ecotoxicology: in-situ monitoring, ROV, modelling and big-data techniques		OH
13	7 May	Current pollution problems, Ecological risk, and Evolution of resistance to pollution		OH
	9 May	Global change – Marine ecotoxicology in the future		OH
14		*Final Exam*		OH