OCES 3302 MARINE POLLUTION SOURCE TRACKING (3 CREDITS)

Instructor: Stanley Lau, Department of Ocean Science, HKUST
Class schedule: 9:00 am to 10:20 pm, Tuesdays and Thursdays; **Venue**: Room 5506
Office hours: by appointment

Course description
The marine ecosystem is vulnerable to a variety of pollution originating from land, including sewage, industrial waste, and runoff. These sources are often hidden or dispersed, lacking a single point of discharge. Identifying the origins of pollution is critical for the development of effective countermeasures and accurate evaluation of environmental and health impacts. Pollution source tracking is an interdisciplinary endeavor that requires expertise in microbiology, chemistry, hydrodynamics, and more. In this course you will:

- **Investigate** the sources of water pollution in our city and examine the approaches to control it
- **Gain** a comprehensive understanding of the principles and state-of-the-art technologies in pollution source tracking; and
- **Evaluate** real-world case studies from Hong Kong and around the world.

Intended learning outcomes
By the end of this course, you will be able to:

1. **Identify** the sources and nature of land-based pollution in the marine environment;
2. **Appreciate** the challenges associated with tracking the sources of land-based pollution in the marine environment, including the limitations of current technologies and the need for interdisciplinary approaches;
3. **Compare** different pollution tracking methods for advantages and limitations;
4. **Communicate** effectively about pollution and its environmental impact observed in a given location in the society and the results of pollution source tracking to non-specialists, such as policymakers and the general public, using non-specialist language and appropriate visual aids.

Learning materials and activities
Before lecture:

- PowerPoint slides and reference materials will be uploaded to Canvas

During lecture:

- The slides will be explained and they may be supplemented by video clips
- Polling and Q&A through iPRS (https://itsc.hkust.edu.hk/services/academic-teaching-support/teaching-tools/prs/iprs)

After lecture:

- Self-review of learning materials
- Preparation for continuous assessment and group project

Field trip:

- Yuen Long Bypass Floodway Ecotour (https://www.dsd.gov.hk/EN/HTML/431.html)
- **10 am – 12 pm, 16 November 2024 (Saturday)**
- **Compulsory**; in substitution of the lecture on **17 October 2024**

Assessment tasks

- In-class participation through iPRS (20 %)
- Structured questions on canvas (3 assessments x 20 % each)
- Group project oral presentations (20 % total; 15 % on individual presentation performance and 5 % on peer evaluation among group members)

Structured questions assessment schedule

- 26 September 2024 (20 %)
- 22 October 2024 (20 %)
- 21 November 2024 (20 %)

Group project presentation

- 26 and 28 November 2023

Mapping of course ILOs to assessment tasks

Assessed task	ILOs	Explanation
In-class participation through iPRS	1,2,3	The in-class participation will assess students' immediate understanding of the materials taught during lectures.
Structured questions on Canvas	1,2,3	The structured questions will assess students' comprehensive understanding of the lecture material and their ability to use higher-order thinking to tackle the scenarios given in the questions.
Group project	1,2,3,4	The group project presentations will require students to demonstrate a comprehensive grasp of the knowledge learned in the course, apply the knowledge to a real-life situation observed in the field, and effectively communicate their findings on pollution sources identified.

Communication and Feedback

Assessment marks for individual assessed tasks will be communicated via Canvas within two weeks of submission. Students who have questions about the marks should consult the instructor within five working days after the feedback is received.

Course AI Policy

The use of Generative AI in assessment tasks is permitted. However, you must declare its use. Using generative AI without declaration will be considered as academic misconduct.

Academic Integrity

Students are expected to adhere to the university's academic integrity policy ([URL]). All submissions will be scanned using anti-plagiarism software. Suspected and confirmed cases of plagiarism will be handled in accordance with university policy.

Final grade descriptor

Grades	Short description	Elaborate on subject grading description
A	Excellent performance	Demonstrates an outstanding grasp of the sources, nature and challenges of tracking land-based marine pollution. Exhibits exceptional ability to evaluate different pollution tracking methods and effectively communicate findings in an oral presentation.
B	Good performance	Demonstrates a strong understanding of the sources and impacts of land-based marine pollution and the obstacles in tracking them. Shows proficiency in analyzing the pros and cons of various tracking techniques. Communicates reasonably well to different audiences.
C	Satisfactory performance	Displays a basic grasp of the sources and impacts of land-based marine pollution and the challenges in tracking them. Has an adequate ability to assess different tracking methods and convey information.
D	Marginal Pass	Exhibits a basic grasp of the subject matter, but has difficulty evaluating tracking techniques and communicating findings effectively.
F	Fail	Lacks fundamental understanding of the course concepts regarding pollution sources, tracking methods and their evaluation. Unable to communicate information effectively and coherently.

COURSE SCHEDULE:

Week	Topic
1 - 2	- Course Introduction - Defining pollution - Water pollution control in HK

3 - 4	- Sources of land-based pollution in the marine environment
	  - Point source vs. non-point source
	  - Anthropogenic vs. natural

5 - 7	- Routine / long-term pollution monitoring programs of beach water quality conducted by government agencies in HK and elsewhere in the world
	  - Purpose of the monitoring
	  - Strategy, methods, and reference standards
	  - Advantages and limitations

8 - 9	- Overcoming biases and limitations in routine monitoring program
	  - Issues associated with the loss of cultivability in bacteria
	  - Genomic and proteomics approaches
	  - Whole microbial community approach

10 – 11	- Emerging biological tracers of pollution sources
	  - Pepper mild mottle virus
	  - Detection methods
	  - Quality control and assurance
	  - Interpretation of results
	  - Limitations

12 – 13	- Tracking of SARS-CoV-2 in sewage - Presentation of group project