

Course Introduction

Course Schedule, Location and Instructor information

Instructor: Dr. Cindy Lam (Email: envscindy@ust.hk)

Course Description

Students will gain hands-on experience in field survey and sampling, laboratory studies including physical, chemical and biological analyses, experimental design, as well as data analyses and presentations. Course topics include coastal survey, water quality monitoring, marine sediment quality monitoring, etc.

Course Objectives

OCES 3001 is a major required course for undergraduate students majoring in Environmental Science in the School of Science at the Hong Kong University of Science and Technology. The primary objectives of this course is to provide students with hands-on experiences in identifying possible sources of pollutants found in various coastal habitats and suggesting solutions of how to improve/ monitor environmental pollutants using advanced instrumentation and technology.

Course Intended Learning Outcomes

Students will gain essential background knowledge and skills for conducting field and lab works in coastal environmental monitoring. Upon completion of this course, students should be able to

1. Explain the scientific principles underlying the experimental procedures described in individual lab sessions
2. Collect, interpret, and critically analyse scientific data; and draw conclusions from lab studies
3. Practice the common techniques used in coastal environmental monitoring
4. Communicate pollution monitoring and measurement through oral presentation
5. Work independently and collaborate effectively in the teamwork
6. Abide by ethical principles in laboratory work and data interpretation

Course Schedule

| Week | Team | Topic | Format | Follow-up lab |
|------|------|--|----------------|---------------|
| 1 | A+B | Course Introduction & Lab Safety | Online Lecture | / |
| 2 | | No lab session | | / |
| 3 | A+B | Lab 1: Physical Parameters Measurement in Water Samples | Online Lab | / |
| 4 | | | | / |
| 5 | A+B | Lab 2: Total Coliform and <i>E.coli</i> Detection | Online Lab | / |
| 6 | | No lab session | | / |
| 7 | A+B | Lab 3: Microplastics Detection and Quantification | Online Lab | / |
| 8 | | | | / |
| 9 | A+B | Lab 4: Neutral Red Assay + Trace Metal Analysis | Online Lab | / |
| 9 | | <i>Midterm Break</i> | | |
| 10 | A+B | Lab 5: Determination of Total Petroleum Hydrocarbons + Toxicity Assays of Oil-Water Samples Using Brine Shrimp <i>Artemia salina</i> | Online Lab | / |
| 11 | | No lab session | | / |
| 12 | A+B | Data Analysis of Lab 4 and 5 | Online | / |
| 13 | A+B | Course Review & Release of Lab Reports | Online | / |
| - | | Final Examination | / | / |

Course Attendance Requirements

Full attendance is necessary throughout the entire course. Absent for class/ lab session or being late for more than 10 minutes without reasons will lead to mark deduction in your lab report/ continuous assessment. Should you take any sick leave, please provide supporting document (e.g. doctor certificate for medical leave) to course instructor on the day of class/ lab session by email.

Course Assessment

Lab Worksheets x 5 (50%; each 10%)

Final Examination (40%)

Continuous Assessment (10%)

Submission of Lab worksheets and Assignment

Hard-copy of lab worksheets are required to submit to course instructor at the beginning of the next lab session (see schedule below). Class announcement will be made immediately if there is any change in submission date and/or submission method during the semester. All the submissions will be scanned through anti-plagiarism software to avoid plagiarism. Late submission or plagiarism will lead to mark deduction. All the reports (except Lab Worksheet 7) will be returned in the course review.

| Assessment | Team |
|-------------------|-------------|
| Lab Worksheet 1 | A+B |
| | |
| Lab Worksheet 2 | A+B |
| | |
| Lab Worksheet 3 | A+B |
| | |
| Lab Worksheet 4 | A+B |
| | |
| Lab Worksheet 5 | A+B |
| | |

Laboratory Safety Regulations

Personal Safety

1. **Safety goggles** must be worn at all times to avoid chemical spill into eyes in the laboratory. Please get prepare yourself a pair a googles for this lab course.
2. **Lab gown** must be worn in the laboratory where an unexpected chemical spill may expose you to the risk of injury. Concerning the health and safety issues, lab gown will not be available for lending to students at the laboratory. Students with short trousers, open-toed shoes, sandals or other uncovered footwear will not be allowed in the laboratory.

3. **Wear mask** at all times. You are required to complete the health declaration form in the course introduction. To ensure everyone's safety, we will measure your body temperature using electronic thermometer before entering the laboratory. Alcohol will be provided and you are required to wash hands with soap and water as soon as possible before leaving the laboratory.

Lab Safety

1. Make sure you know the exact locations of the safety features of the lab, such as eyewash fountain, safety showers, chemical spill kits, fire extinguishers, fire alarms, fire blankets.
2. Report any accidents immediately to course instructor, technicians and teaching assistants. Do not deal with incidents on your own.
3. Keep your work area clean and organized to reduce the possibility of accidents. Move your personal belongings on the top of the bench during the experiment.
4. Avoid unnecessary exposure to chemicals. Never pipette by mouth. Never taste or inhale chemicals on purpose. Wear gloves when directly working with hazardous chemicals. Use fumehoods when appropriate.
5. Take appropriate precautions. Keep flammables away from hot plates and open flames. Wear gloves when using toxic, carcinogenic, or other hazardous chemicals. Take care with corrosive acids and bases. Always pour concentration acid slowly into water (never water into acid).
6. Chemicals and equipment may not be removed from the lab without permission from the course instructor.

Disposal of Chemical Waste

It is important to dispose the chemical waste properly after each experiment. Follow the guidelines below to protect yourself and avoid contaminating the environment.

1. Generate as little waste as possible. It is expensive to remove hazardous wastes in the treatment process. Do not prepare more of a chemical than you expect to use.
2. Never return unused portions of chemicals to the reagent bottle. At the end of your experiment, unused reagent must be disposed of as waste, so do not pour out more than you need.
3. Do not discard chemicals down the sink or in the trash bin, unless you are explicitly told that it is fine to do so. Most of your chemicals will pose a threat to the environment if disposed improperly.
4. Place chemical waste only in the appropriate container. Often, more than one waste container is provided to separate certain chemicals for safety or easier disposal. If you cannot find a waste bottle labelled with your particular chemical, ask your TA where to dispose it.
5. Do not over-fill a waste container. Inform the technician the bottle is getting full and they will replace it.
6. Use the clearly marked WASTE SOLIDS wide-mouth bottles to dispose of waste solids (e.g. filter paper, weighing paper) or biological wastes.

Laboratory Report Writing

A typical laboratory report may consist of the following parts:

1. Title Page (Optional)

Institutions and supervisors may have different formats and guidelines for this part. Generally speaking, a 'Title Page' should include the title of your lab report, the name(s) of the author(s), the name of supervisor(s) (if any), the name of the department, and the date of submission.

2. Contents Page (Optional)

If your report is quite long (e.g. over 20 pages), you may write a 'Contents Page' to show the sections and sub-sections of the report.

3. Authorization (Optional)

In this part you declare that you are the sole author or a member of the contributors of this report. If you allow your department to share your report with others, you indicate it here.

4. Acknowledgements (Optional)

You express your gratitude to people who have provided you with support in the research process, e.g. your department, your supervisors, and groupmates.

5. Abstract

An abstract is a concise and accurate summary of your research report. It is around 200 words and includes the objective(s), methodology, and key findings of your research. It gives a clue to the readers whether they are reading the paper they are looking for and whether they want to continue reading the main part of your report. In most cases, you will write this part after you complete writing the main part of your report.

6. Introduction

An introduction provides specific background information about your research topic, literature review, research motivation/needs, the hypothesis of your research project, and research objectives. Ideally, the introduction should have a funnel structure (i.e. from general to specific – start with the background information and end with your specific research objectives. The objective and the hypothesis should be connected and outlined logically.

7. Materials and Methods/Methodology

You will first write the plan of your research project, including the dependent and independent variables, as well as any measures to ensure the fairness of the experiments. Then, you will document the materials (e.g. chemicals and apparatuses) that are used in the experiments. Next, you will write the laboratory procedures concisely but clear enough for others to replicate your experiment. You may explain why you choose particular materials and methods for your experiment. In most cases, the whole part is written in past tense.

8. Results

You write a concise summary of your results in this part (i.e. do not include raw data). To facilitate your readers, tables are usually used to show your results clearly. If you are evaluating the causal relationship of two or more variables, you may need to conduct statistical analysis and present the results (e.g. t-test scores, p-value, etc.) in this section

9. Discussion

This section is very important as you interpret the data and show your good understanding of the research. You interpret your results and report any abnormality in the results. Next, you may discuss the limitations of your methodology and suggest ways for improvements (if any). It is also important that you show the significance and importance of your research findings.

10. Conclusion

You conclude the key findings and suggest future direction for research. This section must be concise and precise.

11. References

APA is a common referencing style used in Ocean Science and Life Science disciplines.

12. Appendix (Optional)

There may be a large amount of raw data, calculation procedures, and photos in some research projects. You may want to show these data to increase the comprehensiveness of your report. However, putting all of them in the results part may be too lengthy and confuse your readers. Therefore, you will only put the summary of these data in the results part. Name each appendix (e.g. Appendix A, Appendix B, etc.) and tell your readers in the report which part of the appendix has the supplementary information they are looking for.