

# **OCES 4974 Ocean Science and Technology Research Project I**

## **Course Description**

Students will undertake a research project in ocean science and technology under faculty supervision. OCES 4974 is the first part of a two-term project. After completion of OCES 4974 in the Fall semester, students will need to register for OCES 4984 in Spring. Through the reading of scientific literature, field/laboratory studies, meetings with supervisors, and presentations in laboratory meetings, students will learn:

- (i) the latest knowledge in their chosen field of research,
- (ii) skills in hypothesis synthesis and testing,
- (iii) experimental design,
- (iv) data collection and analysis, and
- (v) scientific communication. Students will be evaluated for their performance through continuous assessment by the supervisor and an oral presentation held at the end of the Fall semester. For third-year or fourth-year OCES students only. Instructor's approval is required for enrollment.

## **Intended Learning Outcomes**

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

- 1) Explain in detail the current and emerging trends in the area of ocean science and technology research chosen by the student.
- 2) Demonstrate basic skills in formulating objectives, making hypotheses and designing experiments for a scientific investigation.
- 3) Conduct independent lab experiments and/or field studies.
- 4) Critically analyze and interpret the data of the experiments and/or field studies, address the limitations and biases of the investigation methods, draw scientifically valid conclusions, and explain the importance of the research findings by making reference to existing knowledge.
- 5) Effectively communicate the research findings in oral presentations and in written reports.
- 6) Work independently and collaborate effectively.

## **Assessment**

1. Experiment (continuous assessment by project supervisor(s)) (30%)
2. Oral presentation (30%)
  - Presentation duration: Each student 10 min + 5 min Q&A
  - The content of the presentation should include:

- i. Introduction to the research topic
- ii. Project objectives
- iii. Research methodology

3. Written report (40%)

- \*Students should submit their written reports to their corresponding supervisor(s) directly for grading.
- Word limit: 1000 words
- The content of the report should include:
  - i. A short literature review related to the research topic
  - ii. Project objectives
  - iii. Research methodology
  - iv. Preliminary results (if any)

***OCES 4974 Rubrics for Continuous Assessment, Oral Presentation, and Written Report***

**Rubrics for Continuous Assessment (30%)**

	<b>Exemplary</b>	<b>Satisfactory</b>	<b>Needs Improvement</b>
<b>a) Knowledge (10%)</b>	<ul style="list-style-type: none"> <li>• Demonstrated strong and broad knowledge not only in the project area, but also in related subjects of environmental science</li> <li>• Assimilated a wide range of knowledge into the project</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrated sufficient knowledge in the project area</li> <li>• Incorporated subject-specific knowledge into the project</li> </ul>	<ul style="list-style-type: none"> <li>• Insufficient knowledge in the project area</li> <li>• Failed to integrate subject knowledge into the project</li> </ul>
<b>b) Practical Skills (10%)</b>	<ul style="list-style-type: none"> <li>• Proactive in thinking through and solving problems encountered</li> <li>• Demonstrated high levels of competency in technical skills required for the project</li> </ul>	<ul style="list-style-type: none"> <li>• Exhibited certain ability in solving problems related to the project</li> <li>• Having sufficient technical skills to complete the project satisfactorily</li> </ul>	<ul style="list-style-type: none"> <li>• Failed to solve problems related to the project</li> <li>• Unable to demonstrate technological skills satisfactorily</li> </ul>
<b>c) Critical Thinking (5%)</b>	<ul style="list-style-type: none"> <li>• Demonstrated strong ability in analyzing and interpreting data and incorporating ideas from literature</li> <li>• Always actively participated in discussions (e.g. lab meetings, seminars)</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrated certain ability in analyzing and interpreting data and incorporating ideas from literature</li> <li>• Participated in discussions sometimes</li> </ul>	<ul style="list-style-type: none"> <li>• Failed to analyze and interpret data from the project</li> <li>• Rarely participated in discussions</li> </ul>
<b>d) Personal Development (5%)</b>	<ul style="list-style-type: none"> <li>• Always worked effectively with others in the lab</li> <li>• Always able to manage time effectively and was always well-prepared to meet deadlines</li> </ul>	<ul style="list-style-type: none"> <li>• Worked effectively with others most of the time</li> <li>• Managed time effectively in general</li> </ul>	<ul style="list-style-type: none"> <li>• Failed to work in a team</li> <li>• Lacked time management skills</li> </ul>

### Rubrics for the Assessment of Oral Presentation (30%)

	<b>Exemplary</b>	<b>Satisfactory</b>	<b>Needs Improvement</b>
<b>a) Knowledge &amp; organization (9%)</b>	<ul style="list-style-type: none"> <li>• Demonstrated sound understanding of the research topic</li> <li>• Defined well and clear project objectives</li> <li>• Presented with logical organization and coherent information</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrated a fair understanding of the research topic</li> <li>• Defined fair project objectives</li> <li>• Presented with logical organization and coherent information in most parts</li> </ul>	<ul style="list-style-type: none"> <li>• Insufficient understanding of the research topic</li> <li>• Defined poor or no project objectives</li> <li>• Lacked organization and coherence in the presentation</li> </ul>
<b>b) Project objectives (9%)</b>	<ul style="list-style-type: none"> <li>• Created clearly defined, realistic and achievable project objectives</li> <li>• Delivered project timeline with milestone</li> </ul>	<ul style="list-style-type: none"> <li>• Created a general sense of defined, realistic and achievable project objectives</li> <li>• Delivered general project timeline with milestone</li> </ul>	<ul style="list-style-type: none"> <li>• Defined overly board, unrealistic and unachievable project objectives</li> <li>• Lacked project timeline and milestone</li> </ul>
<b>c) Research methodology (9%)</b>	<ul style="list-style-type: none"> <li>• Explained clearly all of the methodological approach</li> <li>• Described how data is collected and analyzed in the research</li> <li>• Evaluated and justified clearly the methodological choices</li> </ul>	<ul style="list-style-type: none"> <li>• Explained most of the methodological approaches</li> <li>• Described briefly how data is collected and analyzed in the research</li> <li>• Evaluated and justified briefly the methodological choices</li> </ul>	<ul style="list-style-type: none"> <li>• Poorly explained the methodological approaches</li> <li>• Minimal or no description on data collection and analysis</li> <li>• Poorly evaluated and justified the methodological choices</li> </ul>
<b>d) Presentation Skills, Q&amp;A (3%)</b>	<ul style="list-style-type: none"> <li>• Showed excellent presentation skills</li> <li>• Good time management</li> <li>• Gave correct answers to all questions raised by the audience</li> <li>• Demonstrated outstanding critical thinking skills</li> </ul>	<ul style="list-style-type: none"> <li>• Showed good command of presentation skills</li> <li>• Fair time management</li> <li>• Gave correct answers to most questions</li> <li>• Demonstrated satisfactory critical thinking skills</li> </ul>	<ul style="list-style-type: none"> <li>• Showed poor presentation skills in most parts</li> <li>• Poor time management</li> <li>• Unable to give correct answer to any question</li> <li>• No critical thinking skills</li> </ul>

### Rubrics for the Assessment of Written Report (40%)

	<b>Exemplary</b>	<b>Satisfactory</b>	<b>Needs Improvement</b>
<b>a) Comprehension of Findings (20%)</b>	<ul style="list-style-type: none"> <li>• Highly effective presentation of data in text and graphics.</li> <li>• Data were sufficiently analyzed using appropriate statistical tools</li> <li>• Able to interpret all data accurately, summarize all findings and draw inferences that are consistent with the data and scientific reasoning</li> <li>• Provided adequate and appropriate reasoning for unexpected results and future direction of the research</li> </ul>	<ul style="list-style-type: none"> <li>• Sufficient skills in the presentation of data in text and graphics</li> <li>• Most data were analyzed with appropriate statistical tools and</li> <li>• Able to interpret and summarize most of the findings and draw inferences that are consistent with the data and scientific reasoning</li> <li>• Provided some suggestions for unexpected results and future direction of the research</li> </ul>	<ul style="list-style-type: none"> <li>• Ineffective presentation of data in text and graphics.</li> <li>• Unable to analyze the results statistically / understand statistical results</li> <li>• Insufficient / inaccurate interpret of findings</li> <li>• Inferences are not consistent with the data and scientific reasoning</li> <li>• Cannot provide any suggestions for unexpected results or future direction of the research</li> </ul>
<b>b) Language &amp; Organization (10%)</b>	<ul style="list-style-type: none"> <li>• All contents were logically presented and well organized</li> <li>• Excellence in scientific writing and use of English</li> <li>• Less than 10% similarity checked under turnitin</li> </ul>	<ul style="list-style-type: none"> <li>• Most contents were logically presented and well organized</li> <li>• Sufficient skills in scientific writing and use of English with only a few errors</li> <li>• 10-30% similarity checked under turnitin</li> </ul>	<ul style="list-style-type: none"> <li>• Failed to present contents in a logical and organized manner</li> <li>• Unable to demonstrate skills in scientific writing and/or use of English</li> <li>• Over 30% similarity checked under turnitin</li> </ul>
<b>c) Citation &amp; References (10%)</b>	<ul style="list-style-type: none"> <li>• Adequately and accurately cites ideas and information of others</li> <li>• Reference list is complete and well-organized</li> </ul>	<ul style="list-style-type: none"> <li>• Cites ideas and information of others with only few errors and omissions</li> <li>• Some errors and omissions in the reference list and/or its formatting</li> </ul>	<ul style="list-style-type: none"> <li>• Grossly inadequate and inaccurate citation of ideas and information of others</li> <li>• Multiple errors and omissions in the reference list and /or its formatting</li> </ul>