The Hong Kong University of Science and Technology

Descriptive Physical Oceanography

OCES 2003

3 credits

Pre-requisites: (PHYS 1101 OR PHYS 1111 OR PHYS 1112 OR PHYS 1312) AND (MATH 1012 OR MATH 1013 OR MATH 1020 OR MATH 1023). Can be done as co-rerequistes.

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Consultation Hours: after lecture, Rm 5482 (Lift 25/26)

Course Description

The ocean is dynamic and how it transports and stores tracers in marine environments highlight the crucial role of physics to other areas of marine sciences. This descriptive physical oceanography course introduces concepts, terminology and topics in physical oceanography relevant to anyone involved in ocean/marine sciences, be it in an ecology/biology/chemistry or in an engineering/physics/mathematics capacity, and is compulsory for all OCES majors. While the course will touch on some specialised geographical characteristics of the physical phenomena, the primary focus of the course will be on *dynamical* processes from a descriptive point of view, as the dynamics part is more widely applicable.

Intended Learning Outcomes (ILOs)

By the end of this course, students should be able to:

1. Describe and explain how physics exerts an influence on other marine science topics, certainly on spatial scales larger than around a few meters and time-scales longer than a few minutes.

2. Recall concepts and terminology in physical oceanography that are common in marine/ocean sciences.

3. Perform basic quantification in relation to the physical principles.

4. Describe the underlying principles to observed phenomena in the ocean of relevance to ecology / climate etc.

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.

Assessments:

All written assessments are to be sent in as a pdf or png and submitted on Canvas. Don't send me a word document.

For all assignments themselves, students are allowed a 5 day (24*5 = 120 hours; not 5 business days) grace period with no questions asked (but you need to let us know on or before the assignment due time). Any further requests for extensions will require some proof (e.g. medical note, proof of internet going down

such as electrical outage so Canvas submission was not possible). Measure of lateness will be done via the Canvas timestamp, and will be at 1% per minute penalty (i.e. don't bother handing anything in after 100 mins, because you already got zero).

Assessment Task	Contribution to Overall Course grade (%)	Due date
Assignment 1	15%	*
Assignment 2	15%	*
Midterm	15%	
Assignment 3	15%	*
Assignment 4	15%	*
Finals	15%	
Class attendance	10%	continuous

* Assessment marks for individual assessed tasks will be released within two weeks of the due date.

Mapping of Course ILOs to Assessment Tasks

Assessed Task	Mapped ILOs	Explanation
All assignments	ILO1, ILO2, ILO3, ILO4	All assignments are constructed with marks stratified so that the more ILOs the student can demonstrate, the higher their marks.
Midterm and Final	ILO2, ILO3	As assignments, but over a shorter period of time and focuses more on material recall and some quantification.
Class attendance	ILO1, ILO4	Class attendance to discuss concepts (ILO1) and find links with other scientific areas (ILO4).

Grading Rubrics

All four assignments are marked out of 22, with full marks being 20 (so 22/20 still only gets you 20/20). Roughly 14-16 marks will be given for "book work", which will get you a B. The marks associated with the questions thereafter are deliberately challenging, so you have to work for that A. Each assignment have a due date of a week.

The midterm and finals work similarly, and will be marked out of 30, but both have more than 30 marks that could be gotten. Midterm works on a Olympiad-style multiple choice during class near lecture numebr twelve: 20 questions, four choices each question, 2 marks for each correct answer, 1 mark deducted for every wrong answer, no credit if question is skilled (so you get penalised for guessing). Finals are take home and usually over a weekend during exam time and should really be regarded as a short but timed assignment but with a due date of two days (instead of a week).

For class attendance, 20 lectures sessions are scheduled (with 4 tutorial classes), and discounting the add/drop period, out of the remaining 16 classes, students should turn up to at least 13 of these for full credit (zero credit for those who turn up for 3 or less, going up as a linear function of number of classes attended). Class attendance will be taken towards the end of the class.

Final Grade Descriptors:

See also provided model good and bad hand-ins provided on the course GitHub page. The below are sample grade boundaries subject to minor adjustments (except the F grade boundary which is non-negotiable).

Grades	Short Description	Elaboration on subject grading description
A	Excellent Performance (>85% in the course)	Shows mastery of knowledge and understanding of the main subject matter, can problem-solve.
B	Good Performance (70 – 85% in the course)	Shows good knowledge and understanding of the main subject matter, competence in problem-solving.
C	Satisfactory Performance (50 – 70% in the course)	Shows adequate knowledge and understanding of the main subject matter, some issues with problem-solving.
F	Fail (<50% in the course)	Shows poor knowledge and understanding of the main subject matter, struggles with problem-solving.

Course AI Policy

Use of AI is allowed, but the assignments will be structured in such a way it probably won't help anyway. The midterm is the only assessment that is closed book with no access to any external material.

Communication and Feedback

Assessment marks for individual assessed tasks will be communicated via Canvas within two weeks of submission. Feedback on assignments will include a marked up PDF report with marked up comments, and a breakdown of the marks. Model solutions with detailed mark scheme will always be provided. Students who have further questions about the feedback including marks should consult the instructor within five working days after the feedback is received.

Resubmission Policy

Given the arrangements already for no-questions asked extensions and the use of continuous assessment, no resubmission or alternative assignments will be provided under normal circumstances.

Required Texts and Materials

Nothing strictly required, but https://github.com/julianmak/academic-notes/blob/master/descriptive po.pdf is a written up and more elaborate version of the lecture content.

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.

[Optional] Additional Resources

- Knauss (1997), “Introduction to physical oceanography”, 2nd edn., Waveland Press Inc.
- Wunsch (2015), “Modern observational physical oceanography”, Princeton University Press
- Pickard & Emery (1990), “Descriptive physical oceanography”, 5th edn., Pergamon Press
    - don’t personally recommend this one, might suit some people
- Talley et al. (2011), “Descriptive physical oceanography”, 6th edn., Academic Press
    - strongly recommend this over the one above
- Williams & Follows (2012), “Ocean dynamics and the carbon cycle”, Cambridge University Press
- Karnauskas (2020), “Physical oceanography and climate”, Cambridge University Press
- Vallis (2006), “Atmospheric and oceanic fluid dynamics” 1st edn, Cambridge University Press