

# EOSC 373: Introductory Oceanography: Climate and Ecosystems January 2020

## 1. Calendar Description

Physical, chemical, and biological processes in the ocean and their interaction with climate and marine food-webs. Three credits. This course carries EARTH credit for General Science Students.

## 2. Prerequisite: EOSC 372

**3. Exclusions:** EOSC 373 may not be taken by students who have credit for any of EOSC 370 or EOSC 371 or BIOL 305

## 4. Course Learning Goals

1. DESCRIBE the processes that control the fates (sinking, remineralization & transfer to upper trophic levels) of marine primary productivity
2. DESCRIBE the ocean's role in heat transfer and heat storage within the global climate system
3. EXPLAIN how physical, chemical and biological processes in the ocean control atmospheric CO<sub>2</sub>
4. DESCRIBE the physical, chemical and biological impacts that anthropogenic CO<sub>2</sub> & climate change are having on the ocean
5. EXPLAIN the presence of swift western boundary currents using vorticity arguments
6. DESCRIBE the dynamic balances and movement characteristics of Rossby and Kelvin waves

## 5. Class Email

To ask questions, e-mail: [eoasc-373@eoas.ubc.ca](mailto:eoasc-373@eoas.ubc.ca)  
(your e-mail will go to the course Instructors and TAs only)

## 6. Instructors

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## 7. Teaching Assistants

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## 8. Meeting Times

Lectures will be held at 10:00-11:00 Monday, Wednesday and Friday in Chemistry Bldg. C124.

## **9. Office Hours**

Instructors: By appointment.

TAs: Please note that the TAs will only attend the office hours if they have received at least one student's request 24 hours before the office hour.

The TA hours will be held in room ESB 4009 on Tuesdays from 13:00-14:00.

## **10. In General**

- This course and its partner EOSC 372 are intended as an introductory course to modern oceanography. This course is ideal for 1) those students with a major elsewhere and a keen interest in oceanography; 2) those students intending to major in oceanography; and 3) graduate students in oceanography needed a good grounding in those fields of oceanography outside their specialty.

- EOSC 372 and 373 are the pre-requisites to most 400-level oceanography courses.

## **11. Evaluation**

The course will be evaluated in four ways. Tests and examinations will be on material covered in the lectures or specified in the assignments.

### **(1) Final Exam**

The final exam covers the whole course with the lectures after the last test having about twice as many marks associated with them as previous lectures. The final exam will take place during the official exam period and is scheduled by student services.

### **(2) In-class Tests**

There are 3 in-class tests in total. You must attend 2: there are no other allowances for missed tests. (If you do miss two tests due to illness, you must produce medical evidence for both. In this case, your exam will be weighted more heavily.) Dates for the tests are in section 15 of this syllabus. More information on policies and examples of previous tests will be posted on the website.

### **(3) In-class Clicker Questions**

There will be one or more i-clicker questions in most lecture periods. These questions will be used to give students time to think about the material presented in-class and to check student understanding of the course material or to test/evaluate assignments. Five marks total of the final mark may be based on clicker questions: three on participation and two on percentage of correct answers. Some questions will be participation only (i.e. will not count toward the accuracy mark).

Students are required to purchase an i-clicker, which are available from the UBC bookstore, unless they already have one from another class. Note that you need an i-clicker not a PRS clicker.

You earn clicker participation marks every time you answer a clicker question. We also give you a 20% "grace space", which means that you are free to forget your clicker, run out of batteries, or have technological difficulties 20% of the time with no penalty. For example, let's say there are

50 clicker questions during the term and you answered 40 of them (with ANY answer, it doesn't have to be the correct answer!). You would earn the full 3% for full participation. Please note that one of the purposes of the 20% "grace space" is to cut down on troubleshooting every single clicker incident, which will save everyone time. This 20% leeway is to your benefit. Please refrain from reporting every time you forget your clicker, miss class, or run out of batteries. The "grace space" should accommodate all of these issues with no penalty to you. Clicker accuracy marks are done in a very similar way. You have 20% "grace space" which means if you are free to not answer or answer wrongly with no penalty up to 20% of the accuracy questions. Clicker accuracy is worth a maximum of 2% of your final mark and half of this (1%) is "bonus". While the question is running you may change your answer if you wish. Simply press the new answer. Clicker participation questions only contribute to the clicker participation mark. However, clicker accuracy questions contribute to both the participation mark and the accuracy mark. So if you are not sure of the answer, do enter your best guess.

*Register your Clicker:*

Go to the webpage for this course and register your clicker id. (click icon on home page and follow instructions).

*Normal Clicker Use: Start of Class*

- Hold down the power button until the led flashes, enter AB

*Normal Clicker Use: Each Question*

- Press the button corresponding to your answer
- Check the "answer" light on top flashes green once (not red three times)
- If it flashes red, try again
- You can change your answer by re-entering a new answer, up until the cut-off time for the question

**(4) Online Quizzes**

Because this is an introductory course that builds upon itself, students will get much more out of the course if they keep-up with the material. Thus, there will be a short assignment after most classes. These are intended to take less than an hour. Most will consist of a reading or a problem and then a follow-up quiz taken on the web to assess your understanding of the assignment and give you feedback. There will also be a 20% grace space policy for online quizzes (see section on clicker above). Note that all online quiz marks are accuracy marks. Follow up quizzes must be completed by 8:00 am on the due date.

**Mark Weighting**

Your final mark will be calculated two ways and you will be given the higher mark.

**Method 1** (with class participation marks)

50% Final Exam

40% Best two in-class tests

5% In-class clicker questions: 3% participation, 2% accuracy (second accuracy mark is a bonus mark)

6% On-line assignments

1% Bonus, surveys and other extras

**Method 2** (without class participation marks)

- 54% Final Exam
- 40% Best two in-class tests
- 6% On-line assignments
- 1% Bonus, surveys and other extras

## **12. Text**

There is no textbook for this course. A recommended reading package is available at the bookstore "EOSC373 Reader". Please note that the lecture slides will be posted on CANVAS by 6:00 pm the day before the lecture. When possible, links to online textbooks and manuscripts will be posted on our CANVAS website.

## **13. Web**

We will use a CANVAS webpage for this course. It includes: lists of learning goals, links to supplementary readings and animations, assignments and their online quizzes, a link to register your i-clicker, this syllabus, a map, answers to your questions on the course material (FAQ), post-lecture i-clicker questions/slides. Please send questions to [eosc-373@eoas.ubc.ca](mailto:eosc-373@eoas.ubc.ca).

For computer access to the CANVAS website, go to: [canvas.ubc.ca](http://canvas.ubc.ca)

## **Important Dates**

- First class: January 6
- First class with Clicker Questions: Jan 8
- First Assignment/Quiz DUE date: Jan 9
- Last day to withdraw from course without a 'W' appearing on transcript Jan 17
- Test 1: Jan 29
- Last day to withdraw from course: Feb 10
- Test 2: February 26
- Mid-term Break, no class: Feb 17-21 (inclusive)
- Test 3: March 25
- Last class: April 8
- UBC will be closed for Easter between April 10 – 13, inclusive
- Final Examination, within the official examination period: April 14-29, inclusive. This examination period is set out in the Calendar and no work, vacation, interviews or other arrangements should be made for this period. Note: examination period includes Saturdays.

## 15. Contents

Section/Topic	Date	Instructor	TA
<b>I Controls of oceanic PP</b>			
T1-1 Introduction	Jan 6	ALL	BM/TH
<b>II Fate of PP: Food webs</b>			
T2-1 Zooplankton diversity	Jan 8	MM	BM
T2-2 Zooplankton distribution & grazing	Jan 10	MM	BM
T2-3 Bacteria/Viruses & New vs. regenerated PP	Jan 13	MM	BM
SNOW DAY; MISSED CLASS			
T2-4 Microbial Loop, PP & fish yield	Jan 17	MM	BM
<b>III Fate of PP: sinking, regeneration &amp; burial</b>			
T3-1 Heat and salt budgets	Jan 20	SW	TH
T3-2 Water masses	Jan 22	SW	TH
T3-3 Temperature-Salinity plots and thermohaline circulation	Jan 24	SW	TH
T3-4 Source, composition and distribution of particles in the ocean	Jan 27	GP	BM
<i>TEST # 1</i>			
T3-5 Sinking particles vs suspended particles	Jan 31	GP	BM
T3-5 Sinking particles vs suspended particles (continuation)	Feb 3	GP	BM
T3-6 Fate of particle constituents in the ocean: Organic matter	Feb 5	GP	BM
T3-6 Fate of particle constituents in the ocean: Organic matter (continuation)	Feb 7	GP	BM
T3-7 Fate of particle constituents in the ocean: Opal	Feb 10	GP	BM
T3-8 Fate of particle constituents in the ocean: Calcium carbonate	Feb 12	GP	BM
Fate of particle constituents in the ocean: Calcium carbonate	Feb 14	GP	BM
<b>MIDTERM BREAK (Feb 17-21)</b>			
<b>IV What are the roles of the ocean in controlling climate?</b>			
T4-1 Vorticity	Feb 24	SW	TH
<i>TEST # 2</i>			
T4-2 Wind driven circulation (Sverdrup Circulation)	Feb 28	SW	TH
T4-3 Western Intensification (Stommel Circulation)	Mar 2	SW	TH
T4-4 Ocean circulation & heat flux	Mar 4	SW	TH
T4-5 The global carbon cycle	Mar 6	KB	BM
T4-6 Factors controlling exchange of C between atmosphere & ocean – solubility pump	Mar 9	KB	BM
T4-7 Factors controlling exchange of C between atmosphere & ocean – biological pump	Mar 11	KB	BM
T4-7 cont. Factors controlling exchange of C between atmosphere & ocean – biological pump	Mar 13	KB	BM
T4-8 Factors controlling exchange of C between atmosphere and ocean – carbonate compensation	Mar 16	KB	BM
T4-9 Where is anthropogenic CO <sub>2</sub> going?	Mar 18	KB	BM
<b>V Ocean dynamics &amp; polar seas</b>			
T5-1 Surface waves	Mar 20	SW	TH
T5-2 Kelvin waves	Mar 23	SW	TH
<i>TEST # 3</i>			
T5-3 Rossby waves	Mar 27	SW	TH
T5-4 ENSO (only ½ to ¾ lecture)	Mar 30	SW	TH
T5-5 Polar Seas: Physical	Apr 1	SW	TH
T5-6 Polar Seas: Biological	Apr 3	MM	TH
<b>VI Impacts of anthropogenic CO<sub>2</sub> &amp; climate change on the ocean</b>			
T6-1 Impact of global warming on the ocean I	Apr 6	SW /MM	TH
T6-2 Impact of global warming on the ocean II	Apr 8	SW /MM	TH

