

EOSC 372

Introductory Oceanography: Circulation and Plankton

Version: Aug 31, 2015

1. Calendar Description

Physical and chemical processes and their controls on the distribution of plankton in the ocean. Three credits. This course carries EARTH credit for General Science Students.

2. Prerequisites

Either (a) one of PHYS 101, PHYS 107, PHYS 153 and one of CHEM 111, CHEM 121, CHEM 154 and one of MATH 101, MATH 103, MATH 105, MATH 121; or (b) SCIE 001. It is assumed that you have high school biology or BIOL 111.

3. Exclusions

EOSC 372 may not be taken by students who have credit for any of EOSC 370 or EOSC 371 or BIOL 305

4. Course Learning Goals

Upon completion of this course, students will be able to:

- Point to any place in the ocean, and for any season predict the primary production¹ and productivity²: starting with the wind field, reconstructing the surface currents, discussing the tides, upwelling or downwelling, stratification and mixing and thus determining the nutrient and light availability for phytoplankton.
- Explain the underlying principles of physical, chemical and biological oceanography to a fellow science student.
- Appreciate how the ocean works and its important role in the global environment and human existence.

5. Class Email

To ask questions, please email: eosc-372@eos.ubc.ca. This goes to Instructors and TA's only. It is highly recommended you email this list instead of individual instructors or TA's because sometimes one of us is unavailable for a week or more.

6. Instructors

Dr. Rich Pawlowicz, 3019 ESB, eosc-372@eos.ubc.ca³
Dr. Kristin J Orians, 3055 ESB, eosc-372@eos.ubc.ca³
Dr. Maite Maldonado, 2067 ESB, eosc-372@eos.ubc.ca³

¹Amount of plant biomass

²Rate of growth of plant biomass

³Send questions on course material, course structure, tests, exams etc. to eosc-372@eos.ubc.ca. Our individual emails (only use for non time sensitive issues) are rpawlowicz@eos.ubc.ca, korian@eos.ubc.ca, and mmaldonado@eos.ubc.ca.

7. Teaching Assistants

Nari Sim (chemistry) Ania Posacka (biology) Idalia Machuca (physics)

For all TA's, the e-mail address is: eos-372@eos.ubc.ca

8. Meeting Times

Lectures will be held at 12:00 noon Monday, Wednesday and Friday in the Earth Science Building (ESB) Lecture Theatre 1013.

9. Office Hours

Weekly Office Hours: Tuesday 13:00-14:00; Friday 14:00-15:00 in ESB 2025. Weekly office hour will be available provided students let the TA's know (email eos-372@eos.ubc.ca) that they are coming. Extra office hours may occur (see webpage).

10. In General

This course and its partner EOSC 373 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 and 2) those students majoring in oceanography and 3) graduate students in oceanography needing an introduction to 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 and/or specified in the assignments through the use of learning goals.

Final Exam

The final exam covers the whole course with the topics after the last test having about twice as many marks associated with them per topic as previous topics (i.e. if each topic has about 2 multiple choice questions, the topics after the last test will have 4). The final exam will take place during the official exam period and is scheduled by student services.

For the in-class tests and final exam students will be allowed to bring a Sharp EL-510R calculator. This is the only calculator permitted. It is the same calculator as used in chemistry courses, it is cheap, and is available at the bookstore or you may be able to find one second-hand or borrow one for the tests and exam. If another calculator is seen during the exam or tests it will be removed. Don't let this stressful event happen to you; get yourself the correct calculator.

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.) Do not "skip" an early test assuming you can write a later one; you cannot be sure you will not be ill, injured or have a family emergency later in term. Dates for the tests are in section 14 of this syllabus.

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In-class Clicker Questions

There will be two or more i-clicker questions in most lecture periods. These questions will be used to give students time to think about the material presented, to check student understanding of the 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 available from the UBC Bookstore or Discount Textbooks, 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, if 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. If you have ongoing, chronic, persistent problems with the clicker system, do contact us, but please ask yourself if they really are chronic, persistent, and ongoing before you do!

Clicker accuracy marks are done in a very similar way. You have 20% "grace space" which means 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.

Normal Clicker Use: Start of Class

- Power on your clicker

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

Register your Clicker

Go to the webpage for this course, click course information and then clickers and then register your clicker id. Check your clicker marks after about two weeks to check that the clicker registration has "worked".

Assignments

One of the main themes of this course is integration between physical, chemical and biological concepts. You will learn to do this through the assignments. This makes the assignments an integral part of the course. Although the marks for the assignments/online quizzes are low, doing and understanding the assignments is important to doing well on the in-class tests and final exam.

You cannot blend concepts if you have not learned them yet. So to help students keep up with the material and learn the concepts as we go along, there will be a short assignment after every class. 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. Note that all quiz marks are accuracy marks. Follow up quizzes must be completed by 8:00 am on the due date. There will also be a 20% grace policy for assignments (see section on clicker above).

Students should bring their completed assignments to class. At random times during term we will collect them and check that they have been completed. We will also use them in class, and may have TA's give feedback on them. The point is to come to class with your assignment, so we do not accept assignments before or after class or by email.

Mark Weighting

Your final mark will be calculated four ways and you will be given the highest mark of the 4 weightings. The various possible components of your marks are:

- Final Exam (everyone)
- Best two in-class tests (everyone)
- In-class clicker questions: 3% participation, 2% accuracy (second accuracy mark is a bonus mark) (only if it increases your mark)
- On-line quizzes (everyone)
- Handing in assignments (full marks for 3 of 4 random collections) (only if it increases your mark)
- Bonus, surveys and other extras (everyone)

Evaluation:	All In	No Clickers	No Assign	Neither
Final Exam	47	51	50	54
In-class Tests	40	40	40	40
On-line Quizzes	6	6	6	6
Assignments	3	3	0	0
Clickers	5	0	5	0
Surveys	1	1	1	1

12. Text

There is no single textbook for this course. A Reader consisting of sections of textbooks is recommended and can be purchased from the bookstore. Links to online textbooks and to specific sections in your Reader will be on the website.

13. Web

We will use a CONNECT webpage for this course. It includes: lists of learning goals, printable versions of the lectures, supplementary readings and animations, assignments and their online quizzes, a student discussion board, a link to register your i-clicker, this syllabus, and answers to your and previous questions on the course material. Please send questions to eos-372@eos.ubc.ca.

For computer access to the web see the Faculty of Science's Links at:

<http://www.science.ubc.ca/students/resources/spaces>

14. Important Dates

- First class: Sept. 9
- First Assignment Due: Sept 11 (and assignments are due every class after)
- First class with Clicker Questions: Sept 11
- Last day to withdraw from course without a 'W' appearing on transcript: Sept 22
- Test 1: Oct 5 (Mon)
- Thanksgiving, no class: Oct 12
- Test 2: Oct 28 (Wed)
- Remembrance Day, no class: Nov 11
- Test 3: Nov 20 (Fri)
- Last class: Dec 4
- Final Examination, tba, within the official examination period: Dec 8 to Dec 22. 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	Instructor	Assign.	TA
Sept. 9 (W)	I Why Study Oceanography? T1-1 Introduction	RP/MM	1.1	
Sept. 11 (F)	T1-2 Course Goals II What is Seawater? What are Phytoplankton? T2-1a Seawater	RP/MM SEA for KO	1.2	IM
Sept. 14 (M)	T2-1b Stratification T2-1c Carbon	RP SEA for KO	2.1 (KO)	IM
Sept. 16 (W)	T2-2 Hydrological Cycle	NS for KO	2.2	
Sept. 18 (F)	T2-3 Residence Time	NS for KO	2.3	
Sept. 21 (M)	T2-4 Diatoms & Dinoflagellates	MM		AP
Sept. 23 (W)	T2-5 Coccolithophorids, Phaeocystis	MM	2.5	AP
Sept. 25 (F)	T2-6 Cyanobacteria	MM	2.6	AP
Sept. 28 (M)	T2-7 Photosynthesis vs. Respiration	MM	2.4	AP
Sept. 30 (W)	III Light Availability for Phytoplankton T3-1 Light, Albedo and K	RP	3.1	IM
Oct. 2 (F)	T3-2 Pigments & Light	MM	3.2(readings)	AP
Oct. 5 (M)	TEST 1	RP/MM (NS)		AP/NS
Oct. 7 (W)	T3-3 Pressure T3-4 Two-layer models (phys)	RP RP	3.3	IM
Oct. 9 (F)	Doing a problem set T3-5 Mixing	RP RP	3.4	IM
Oct. 12 (M)	<i>Thanksgiving (no class)</i>			
Oct. 14 (W)	T3-5 Mixing T3-6 Photosynthesis vs. Irradiance Curves	RP MM	3.5	IM
Oct. 16 (F)	T3-6 Photosynthesis vs. Irradiance Curves T3-7 Critical Depth	MM MM	3.6	IM
Oct. 19 (M)	T3-7 Critical Depth IV Basic Forces & Tides T4-1 Coriolis Force	MM RP	3.7	IM

Date	Section /Topic	Instructor	Assign.	TA
Oct. 21 (W)	Critical depth/compensation assign. take-up T4-1 Coriolis Force	MM RP	4.1	AP
Oct. 23 (F)	T4-2 Geostrophy	RP	4.2	IM
Oct. 26 (M)	T4-3 Tides T4-4 Tidal mixing and Diffusion	RP	4.3	IM
Oct. 28 (W)	TEST 2	RP/MM		IM/AP
Oct. 30 (F)	V Nutrients and Nutrient Cycles T5-1 Nutrients	KO	5.1	NS
Nov. 2 (M)	T5-2 Two-layer models (chem)	KO	5.2	NS
Nov. 4 (W)	T5-3 Nitrogen Cycle	KO	5.3	NS
Nov. 6 (F)	T5-4 Redfield Ratio	MM	5.4	AP
Nov. 9 (M)	T5-5 N*	KO	5.5	NS
Nov. 11 (W)	<i>Remembrance Day (no class)</i>			
Nov. 13 (F)	VI Vertical Transport and use of Nutrients T6-1 Winds	RP	6.1	IM
Nov. 16 (M)	T6-2 Ekman Layers	RP	6.2	IM
Nov. 18 (W)	T6-3 Upwelling/downwelling	RP	6.3	IM
Nov. 20 (F)	TEST 3	RP/KO/MM		IM/NS
Nov. 23 (M)	T6-4 Wind-driven Currents T6-5 Equatorial Pacific	RP RP	6.4	IM
Nov. 25 (W)	T6-5 Equatorial Pacific T6-6 Macronutrients control of global PP	RP MM	6.5	IM
Nov. 27 (F)	T6-6 Macronutrients control of global PP T6-7 Uptake Kinetics, phyto size-structure & paradox	MM MM	6.6	AP
Nov. 30 (M)	T6-7 Uptake Kinetics, phyto size-structure & paradox T6-8 Iron Limitation in the Sea	MM MM/KO	6.7	AP
Dec. 2 (W)	T6-8 Iron Limitation in the Sea VII Summary T7-1 West Coast of Vancouver Island	MM/KO KO/RP/MM	6.8	AP
Dec. 4 (F)	T7-2 Last Years Exam	KO/RP/MM		