

OC 103, Exploring the Deep: Geography of the World's Oceans (4 credits)
Spring 2019 (lectures in Cordley Hall, Room 1109, labs in Strand 313)

Please carefully review the syllabus. It contains important information on course requirements, grading, etc. Save the syllabus for reference during the term.

Course description: OC 103 is an introduction to *oceanography as an interdisciplinary science*. Lectures and labs will cover plate tectonics and the geological structure of ocean basins; physical and chemical properties of seawater; large-scale circulation of the atmosphere and ocean; marine sediment properties and transport; Earth history recorded in marine sediments; the carbon cycle in the atmosphere and sea; and the ecology of pelagic and benthic systems. In addition, numerous integrative lectures will provide links between different disciplines and highlight current research topics, many of which have direct links to humans. We will use basic math, physics, chemistry and biology to understand these topics. *There are no prerequisites, except you need to have an open and curious mind!*

Baccalaureate core: Successful completion of this course partially fulfills OSU's Baccalaureate Core course requirements in the Perspectives category under Physical Science with Laboratory. To completely satisfy the baccalaureate core requirements for science courses with a laboratory component you also need four credits of biological science with laboratory, and an additional four credits in either biological or physical science with laboratory, for a total of 12 credits.

Instructors

Dr. Rick Colwell, Professor

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Dr. Miguel Goni, Professor

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Teaching assistants:

Emily Mazur – mazurem@oregonstate.edu

Anna Simpson – [simpinna@oregonstate.edu](mailto:simpanna@oregonstate.edu)

Office hours:

Please email prior to showing up to office hours.

Goni: Wed 2-3 pm – other times by appointment (via email)

Colwell: Mon 2-3 pm – other times by appointment (via email)

Canvas: This course requires that you use Canvas to answer quiz questions. Canvas is accessed by logging into: <http://my.oregonstate.edu>. Details on how to access Canvas are available from Ecampus: <http://ecampus.oregonstate.edu/services/start/default.htm>. The course will only appear in Canvas to those who have registered for it. All course materials (lectures,

quizzes) are distributed online via the Canvas system. We may also send notes to the class via Canvas. For technical assistance, call 1-800-667-1465 or go to <http://ecampus.oregonstate.edu/services/technical-help.htm>. Although every effort has been made to ensure that course materials are compatible with a variety of hardware and platforms, internet access and *Canvas compatibility is the responsibility of the student*. Extensions for missed deadlines due to personal computer or internet access issues will not be granted. If your computer or internet connection fails, simply go to a campus computer lab or your local library to access the course in Canvas.

Top Hat: We will use the Top Hat (www.tophat.com) classroom response system in class. Some questions in Top Hat that we ask in class will be worth points for participation or for correct answers. Through Top Hat you will be able to submit answers to in-class questions using Apple or Android smartphones and tablets, laptops, or through text message. We will also use Top Hat to administer the midterm and final exams.

You can visit the Top Hat Overview (<https://success.tophat.com/s/article/Student-Top-Hat-Overview-and-Getting-Started-Guide>) at the Top Hat Success Center. This outlines how you will register for a Top Hat account, as well as provide an overview to get you started using the system. An email invitation will be sent to you, but you can also register by visiting our course website: <https://app.tophat.com/e/672024>

Note: our Course Join Code is: **672024**

Top Hat requires a paid subscription, and a full breakdown of all subscription options available can be found here: <https://www.tophat.com/pricing> At least, to use Top Hat for this class, you will need to purchase the one-term subscription with the additional fee for Top Hat test.

Should you require assistance with Top Hat at any time, due to the fact that they require specific user information to troubleshoot these issues, please contact their Support Team directly by way of email (support@tophat.com), the in app support button, or by calling 1-888-663-5491.

Textbook and other resources

- **Textbook:** Paul Pinet. *Invitation to Oceanography*, 7th Edition. McGraw Hill, 512 + pp. The textbook is available in the bookstore, online, or as an e-book. You can rent the book via eBooks for the duration of the class to save money (see links on Amazon and similar). There are also MANY previous versions of the text – any of those from the last decade are fine. If you do not use the version suggested – you are required to identify which sections are being assigned.
- We will strive to make lecture handouts (notes) available on Canvas the night before the lecture. Some of the notes may be incomplete allowing you to fill in key points on your own.
- A laboratory manual is required for class and is available for you on Canvas to download and print. It's located in "Files" in Canvas for OC103.
- **Required software:** To view and print the lecture handouts, you will also need a current (free, online) version of Adobe Reader.

Learning outcomes

After successful completion of OC 103 students will know how to:

1. Describe physical, chemical, biological, and geological aspects of the oceans and relevant spatial and temporal scales of change for ocean systems.
2. Summarize the breadth of oceanography and the interdisciplinary approaches used to understand physical, geological, chemical and biological processes in the oceans.
3. Explain interactions between physical, chemical and biological ocean subsystems.
4. Apply concepts from reading and lecture to solve problems, thereby demonstrating quantitative reasoning and skills.

As a baccalaureate core course in physical science, students taking this class will be expected to:

1. *Recognize and apply concepts and theories of basic physical science.* Oceanography draws on a number of fundamental theories about the earth system such as plate tectonics and upwelling. To understand these concepts students will be required to integrate principles of physics, chemistry, and biology.
2. *Apply scientific methodology and demonstrate the ability to draw conclusions based on observation, analysis, and synthesis.* The ocean is vast and must be measured remotely either by deploying instruments from ships or via satellite since it is inhospitable to man. In this class, you will use various types of data, collected by satellites, moored and towed sensors, and direct sampling of the water column and seafloor to study how the ocean functions. In many cases, you will draw upon multiple data types that will require synthesis.
3. *Demonstrate connections with other subject areas.* Oceanography is an interdisciplinary and applied science with connections to the basic sciences (e.g., physics, chemistry, biology and mathematics) and human society. We will explore ways that these subjects intersect with oceanography, including, but not limited to how density influences the structure of the ocean, how the nature of the water molecule impacts its diverse physical and chemical properties, and how organism size influences food webs in the ocean. Throughout the course, we will also emphasize the many ways the ocean impacts human society - from how El Nino - Southern Oscillation controls storms on the US West Coast to the role of the oceans in the global carbon cycle. This knowledge has implications in fields ranging from economics to public policy.

Course organization: Students in OC103 will have three lectures a week and a weekly lab section. For each week there is assigned reading from the text on the specific subject matter and a quiz that is to be done on Canvas on either Monday and/or Friday. There will be no lecture assignments other than the quizzes and participation in Top Hat; however, each lab will have a weekly lab report due. There are two midterms and a final exam.

Quizzes: The quizzes will focus on reading material and will include assigned reading for the week. These quizzes have a time limit of 35 minutes that starts when you begin the quiz. You are allowed to use your book but you are expected to work by yourselves.

Each quiz can be taken two times. Once at the beginning of the week and once at the end. The higher score will be recorded. Quizzes will first be available from 8 am to midnight on Monday.

Each week's quiz will be available a second time from 8 am to midnight on Friday of the same week including the Friday lecture. **Quizzes must be taken in Canvas so you must have a stable internet platform (wired connection or reliable wireless connection) when you begin the quiz. Do not take a quiz on your cell phone as you may lose your connection while you are taking the quiz.**

Laboratory exercises: Each week includes a laboratory exercise. You must be enrolled in a laboratory section in addition to the lecture. Each lab will have a set of pre-lab questions that you will need to complete ahead of your lab and which will be counted as a separate category (*Student Input to labs*) in terms of points.

Exams: There are two mid-term exams and a final exam. The material covered in the class, including lecture, guest lectures, and readings will be on these tests. The final is comprehensive and will cover material from throughout the course.

Extra Credit: During the lecture/in class, throughout the quarter, we will ask questions using the Top Hat application. This part of the course will count as extra credit for your final grade. You must be in class to participate in these questions. Your participation in these questions and in some cases your correct answer of questions will comprise the extra credit part of your grade. The main reasons for using Top Hat is to gauge the degree to which students understand the material presented in class, to help clarify misconceptions or identify difficult topics, and to encourage discussion.

All deadlines are exact and late work is not accepted: If you have a conflict with an exam, quiz, or lab section you must **make this conflict known – by email to the professors – within the first week of class.** Otherwise, we will follow University guidelines concerning family and health emergencies. *The only exception to this is that you may replace your lowest or a missed quiz score by attending: 1) one of the stargazing outings or 2) a scientific seminar on an ocean topic, writing a brief summary paragraph on the seminar, and providing a hard copy or e-mail copy of this summary to Professor Colwell (rcolwell@coas.oregonstate.edu). You can only replace **one** low or missed quiz score in this way.*

Punctuality: Class starts on time and ends on time. Please be respectful of your fellow students and arrive on time.

Course requirements and grading: Evaluation of a student's performance in class will be determined and weighted according to the following table:

	<u>Fraction of total grade</u>
Quizzes (on weeks 1, 2, 4, 5, 6, 8, 9, 10)	10%
Student input to labs	5%
Laboratory assignments	30%
Oregon Coast Field Trip	5%
Midterm Exam #1 (April 20)	15%
Midterm Exam #2 (May 14)	15%
Final Exam (cumulative; June 11, noon)	<u>20%</u>
Total	100%
Extra-Credit: Top Hat (in class effort)	
Participation and/or correct answers	10%

Course grades: Final grades are based on your point total according to the following scale:

A	≥ 92% of points possible	B-	≥ 80% of points possible	D+	≥ 68% of points possible
A-	≥ 90% of points possible	C+	≥ 78% of points possible	D	≥ 62% of points possible
B+	≥ 88% of points possible	C	≥ 72% of points possible	D-	≥ 60% of points possible
B	≥ 82% of points possible	C-	≥ 70% of points possible	F	<60% of points possible

If, at any time, you are concerned about how you are doing in the course, then please contact Professor Colwell or Professor Goni by email. If at any time you are REALLY INTERESTED in the course, then please contact Professor Colwell or Professor Goni by email.

Incompletes: Final grades are based on the work completed at the end of term. Students should not expect an incomplete if the course is not completed by the end of the term except in extreme and unusual circumstances and even then only if the following two conditions are met: 1) the student has a passing grade at the time the request for an incomplete is made and 2) the student has completed at least 75% of the coursework with a passing grade.

You will need to put effort into this class to do well. This class is designed for people who want to learn, are willing to take responsibility for their learning, and understand how this course relates to their education, their degree program, their personal goals, and the greater world around them. More information on **what you need to do to complete each of the course requirements is found in the following sections.**

Lectures: Full lecture notes are not provided for this course. You are expected to attend class, take notes, and complete the lecture handouts provided. If you miss a lecture it is your responsibility to get the lecture notes from a fellow student. Remember, we ask Top Hat questions in class and these are your chances for extra credit.

Laboratory exercises: Each week includes a laboratory exercise. You must be enrolled in a laboratory section in addition to the lecture. Each lab will have a set of pre-lab questions that you will need to complete ahead of your lab and which will be counted as a separate category in terms of points.

Teaching assistant: Anna and Emily, the teaching assistants (TAs) are responsible for leading the labs and grading your lab assignments. If you have any questions about the labs or grading of your lab assignments, please ask your TA. Questions about any other aspect of the course, such as lecture material, quizzes, exams, or final grades should be directed to the instructors (Goni and Colwell).

Discussion board: On Canvas, there is a discussion board that will be available to ask and answer questions. This is an excellent place to ask questions about course material and to improve your understanding of the course by answering your fellow students' questions. Please use complete sentences when asking and answering questions. Any inappropriate responses that are rude or worse will be deleted and if they continue will result in disciplinary actions.

Turn in only your own work in your own words on all course assignments, including the quizzes. To do otherwise is plagiarism and will not be tolerated. Answers copied word for word from the lectures for lab assignments will receive a zero because they demonstrate no understanding of the material on the part of the student.

Exams: The midterms will have a time limit of 55 minutes and the final will have a time limit of 110 minutes. Permission to take an exam outside of the scheduled window must be arranged well in advance.

Exams are a mix of multiple-choice, True/False and possibly short answer and essay questions. Exams are based exclusively on the lectures and readings of the main text. Exams are closed book, closed note and you are not allowed to access the internet except to use Top Hat.

Preparing for quizzes and exams: Take notes on the lectures, guided by the objective and review questions included with each lecture and at the end of the chapters. Make sure your notes answer these questions. Then, practice, practice, practice for quizzes and exams until you are able to answer the objective and review questions in each lecture without help from your notes, the lectures, or the textbook. If you can answer the review questions without using your notes, the lecture slides, or textbook, you have mastered the material and will do well on the quizzes and exams. When preparing for an exam also make sure to review your weekly quizzes. Post questions to the general discussion board. If you are struggling with the material,

form a study group. Writing notes is a good way to learn and remember subject material (better than just reading or listening).

Other questions? Contact your instructors by email (mgoni@coas.oregonstate.edu or rcolwell@coas.oregonstate.edu). Email is the best way to reach us. Include a descriptive subject line with the course number, for example “OC 103” and address us by our names (e.g., “Dear Dr. Goni”).

Email: We will use your OSU ONID email address to contact you should the need arise, such as a problem with your quiz or lab. If you have not done so, set up your ONID email account using your OSU ID number and pin at <http://onid.oregonstate.edu/docs/gettingstarted/signup.shtml>. If you do not regularly check your ONID email account, set it to automatically forward emails to your preferred email address (see frequently asked questions on the ONID web page).

Responsibilities of students and instructors: Teaching and learning is a partnership between student and instructor. Both student and instructor have certain responsibilities in this partnership that they must fulfill for the teaching (what the instructor does) and learning (what the student does) to be successful. If either student or instructor fails to carry out their responsibilities in this partnership, the student will not be successful in the class. Following is a partial list illustrating these responsibilities.

Responsibilities of instructors:

- Make clear statements of course and lesson objectives.
- Provide course materials (lectures, readings, etc.) directly related to these objectives and keep the course materials as current as possible with ongoing revisions and updates.
- Provide assessments (quizzes, exams) and other graded activities (discussion, labs, etc.) that have clear connections to the course objectives and provide students different ways to demonstrate the degree to which they understand the content covered in the course.
- Provide feedback on graded work that is both useful and timely.
- Be accessible and available to students who ask questions.

Responsibilities of students:

- Be familiar with the course structure and the policies by which the course is taught.
- Become personally invested in and accountable for your education (time, money, commitment).
- Dedicate regular time to preparing for class on an ongoing basis throughout each week.
- Complete all assignments on time and always put forth your best effort. Review the results of graded work and learn from both successes and failures.
- Ask the instructor questions when clarification is needed.

Students with disabilities: Accommodations are collaborative efforts between students, faculty and Services for Students with Disabilities (SSD). Students with accommodations approved through SSD are responsible for contacting the faculty member in charge of the course prior to or during the first week of the term to discuss accommodations. Students who believe they are eligible for accommodations but who have not yet obtained approval through SSD should contact SSD immediately at 737-4098.

Academic conduct: Your conduct in this class and in your interactions with your fellow students must promote a respectful learning environment. You will submit your own work in all your assignments and communications. **All quizzes and exams in this course are individual assessments.** Academic dishonesty, which includes aiding or receiving aid from other students on quizzes and exams, is not tolerated.

Academic dishonesty also includes plagiarizing the work of others and passing it off as your own on quizzes, exams, or on the lab assignments. Plagiarizing will not be tolerated. The first offense will result in an F on the assignment. The second offense will result in an F for the course and referral to the student's academic dean for disciplinary action. Severe incidents of academic dishonesty, such as cheating on an exam, may result in an F for the course and referral to the dean even if it is the student's first offense. Link to OSU Offenses Proscribed by the University: <http://studentlife.oregonstate.edu/studentconduct/offenses-0#offenses>

Course evaluation: We encourage you to engage in the course online evaluation process. The evaluation form will be available towards the end of the term; you will receive instructions through Ecampus. You will login to "Student Online Services" to respond to the online questionnaire. The results on the form are anonymous and are not tabulated until after grades are posted.

How to do well in this class

Although we all have different ways to learn, we suggest the following for this material:

- Pay attention in class and annotate the lecture notes that are provided in Canvas.
- Ask questions in class and on the discussion board.
- Do the readings soon (hours to a day) before a given lecture.
- Add to your class notes based on the readings.
- Organize the material in your mind.
- Most of us learn best by listening, reading, writing, and speaking the material we are trying to learn. This class has been structured for you do to that.

Only when you have structured complex information on your own, have you started to learn. Take advantage of the 'Discussion' questions posted at the end of each chapter in the text to test your knowledge. Try explaining the information to your friends.

Lecture Schedule for OC103, Spring 2019; M, W, F 1300-1350

Date	#	Topic	Lecturer; reading
<i>Week 1</i>			
M, Apr 1	1	Introduction, Ocean Science at OSU, Top Hat	MG & FSC
W, Apr 3	2	The Study of the Oceans	FSC; Pinet Chap 1
F, Apr 5	3	Shape and Nature of the Ocean Floor	FSC; Chap 2
<i>Week 2</i>			
M, Apr 8	4	The Shifting Crust/Plate Tectonics	FSC; Chap 3
W, Apr 10	5	Live ship-to-shore teleconference with scientists on the JOIDES Resolution	FSC & MG
F, Apr 12	6	Marine Sediments	FSC; Chap 4
<i>Week 3</i>			
M, Apr 15	7	Earthquakes, Tsunamis and Oregon's Coast	*Prof. Pat Corcoran
W, Apr 17	8	Properties of Seawater review for midterm	FSC; Chap 5.1-5.4
F, Apr 19		Midterm #1 (up to and including Properties of Seawater)	
<i>Week 4</i>			
M, Apr 22	9	Chemical and Physical Structure of the Ocean	FSC; Chap 5.5-5.7
W, Apr 24	10	Ocean Surface Circulation – Coasts and Gyres	FSC; Chap 6
F, Apr 26	11	Deep Ocean Circulation	MG; Chap 6
<i>Week 5</i>			
M, Apr 29	12	Waves in the Ocean	MG; Chap 7
W, May 1	13	Tides	MG; Chap 8
F, May 3	14	Biol. Productivity; Phytoplankton Survey and NPZ	MG; Chap 10
<i>Week 6</i>			
M, May 6	15	Ocean Ecosystems – Zooplankton and Fish	MG; Chap 10
W, May 8	16	Soft Sediment Communities & Deep Biosphere	MG & FSC; Chap 13
F, May 10	17	Coral Reefs	*Prof. Becky Vega-Thurber Chap 12
<i>Week 7</i>			
M, May 13	18	Life in the Deep Blue Sea, review for midterm	FSC; Chap 13
W, May 15		Midterm #2 (up to and including Life in the Deep Blue Sea)	
F, May 17	19	Oregon Intertidal Communities	FSC; Ch 9; pg 325
Sa, May 18		Field trip to the coast (7am departure; -1.4 tide at 6:50)	
<i>Week 8</i>			
M, May 20	20	Estuaries	MG; Chap 12
W, May 22	21	Hydrothermal Vents/Life Without the Sun	FSC; Chap 10, pg 333-336

F, May 24 22 Polar oceans *Prof. Andrew Thurber

Week 9

M, May 27 **Memorial Day Holiday – No Class**

W, May 29 23 Climate Change and the Oceans MG; Chap 15

F, May 31 24 Ocean Acidification and the Carbon Cycle MG; Chap 15

Week 10

M, June 3 25 El Nino and La Nina MG; Chap 10

W, June 5 26 Oregon Regional Oceanography MG

F, Jun 7 27 Wrap-up, review for the final MG & FSC

W, Jun 12, 6 pm **Final examination**

* denotes guest speaker; FSC denotes Colwell; MG denotes Goni

Laboratory Schedule for OC103, Spring 2019

Lab 1 (Week 1) – Bathymetry

Lab 2 (Week 2) – Plate Tectonics

Lab 3 (Week 3) – Earthquakes and Tsunamis

Lab 4 (Week 4) – Seawater Composition

Lab 5 (Week 5) – Ocean Currents

Lab 6a & 6b (Week 6 & 7) – Marine Productivity

Field Trip (May 19) – Oregon Coast Field Trip

Lab 7 (Week 8) – Seafloor Sediments

Lab 8 (Week 9) – Ocean Acidification