

**ERTH 423: Marine Geology and  
OCN 622: Geological Oceanography  
— ONLINE, FALL 2021 —**

**INSTRUCTORS:**        **CRAIG GLENN**    and    **KATHLEEN RUTTENBERG**  
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**Office Hours:** Send us an email or talk to us to schedule a convenient time  
**Class Times:** Tuesday-Thursday 1:30 – 2:45pm (VIA ZOOM)

**Course Synopsis:** The primary objective of this course is to learn about the origin, structure and evolution of the ocean basins and their margins, ranging from the open ocean and the deep-water abyss to the continental shelves and their coastlines. Our approach is interdisciplinary, requiring integration of chemical, physical and biological processes, as well as geologic processes.

**Readings:** You do not need to purchase a textbook. All required readings will be provided, including excerpts from:

- *The Ocean Basins: Their Structure and Evolution (OB), 2004, 2<sup>nd</sup> edition, Butterworth-Heinemann, in association with The Open University, ISBN No. 0-7506-3983-0.*
- *Marine Biogeochemical Cycles (MBC), 2005, 2<sup>nd</sup> edition, Elsevier Butterworth-Heinemann, in association with The Open University, ISBN No. 0-7506-6793-1.*
- *Earth, by Press and Siever (P&S), 1986, 4<sup>th</sup> edition, W. H. Freeman and Co., ISBN No. 0-7167-1743-3.*
- *Marine Geology, by James Kennett (K), 1982, Prentice-Hall, Inc., ISBN No. 0-13-556936-2.*
- **Other Supplemental Readings from book chapters and articles to be assigned.**

**Laulima:** PDFs will be posted on Laulima, as will course information (syllabus, schedule of lectures, homework assignments, etc.). Laulima will also be used for posting class project materials generated by students enrolled in OCN622.

**Lecture Format:** Lectures for EARTH 423 and OCN 622 are combined, all will be on Zoom, and attendance participation in all lectures is required. The class times will be devoted to lectures, discussion, and occasional in-class activities. Please be sure to read the appropriate section in the assigned readings *before* class. Time will be set-aside at the beginning of each class to answer questions from previous lectures or readings, and to present any current geologic events.

**Grading:** EARTH 423 grades will be based on class participation (8%) and two mid-term exams (46% each). The second exam will be given during final exams week, but will cover only the second half of the class. There will be a separate grading system for Graduate and Undergraduate students.

Important: EARTH 423 (Undergrad.) and OCN 622 (Grad.) have different grading systems: See the separate OCN 622 Syllabus for information about OCN 622 grading.

Make-up exams and incomplete grades will be given only with a written excuse. Full credit for class participation means attending all classes, staying current on the readings, asking good questions during the lectures, and answering questions and participating in class discussions.

**Prerequisites:** EARTH 423 is an Upper Division course with a prerequisite of EARTH 302 (Igneous and Metamorphic Petrology). **The course prerequisite can be waived with consent of the Instructors.**

<b>Tentative Daily Schedule Part I: Dynamics, Geophysics, Igneous &amp; Metamorphic Processes in the Ocean Basins</b>					
<b>Lec.</b>	<b>Day</b>	<b>Date</b>	<b>Topic</b>	<b>Reading</b>	<b>Instructor</b>
1	Tu	24-Aug	Introductions; Goals & mechanics of course	K, 1; OB, 2, P&S, 2	KCR & CRG
2	Th	26-Aug	Introduction to fundamental tenets of geology and marine geology	P&S, 1 & 20; K, 2; OB, 2; supplemental readings	KCR
3	Tu	31-Aug	Geological/Geophysical Techniques: Exploring the Seafloor and Earth's Interior	P&S 4; K4; OB, 2	KCR
4	Th	2-Sep	Geol/Geophys Techniques (con't); Origin of solar system, formation of Earth's moon	P&S 21, K5 & 12, OB2; supplemental readings	KCR
5	Tu	7-Sep	Core formation, Earth's magnetic field, Magnetostratigraphy	P&S 1; K, 5; OB, 2; supplemental readings	KCR
6	Th	9-Sep	Plate tectonics - the basics	P&S 1, 19; supplemental readings	KCR
7	Tu	14-Sep	Plate tectonics - overview	OB 2; P&S 1; K 2, 5	KCR
8	Th	16-Sep	Theory of Continental Drift and Plate Tectonics	P&S 4; K4	KCR
9	Tu	21-Sep	Seafloor spreading, plate motions, plate boundaries	OB 2; P&S 21; K5, 12	KCR
10	Th	23-Sep	Plate boundaries (cont'd); terrains and structure of continents	OB 2; P&S 1; K 2, 5; supplemental readings	KCR
11	Tu	28-Sep	Hot spots, Mantle Plumes; Mechanisms driving plate tectonics	OB 2; P&S 1; K 2, 5; supplemental readings	KCR
12	Th	30-Sep	Large Igneous Provinces and Mass Extinctions	supplemental readings	Guest
13	Tu	5-Oct	Rocks and Minerals	P&S 3	KCR
14	Th	7-Oct	Ocean Basin History & Continent Formation		Guest
15	Tu	12-Oct	Rocks and Minerals (cont'd); Bowens Reaction Series	P&S 3	KCR
16	Th	14-Oct	<b>1st EXAM on Part I only</b>		KCR

<b>Tentative Daily Schedule Part II: Oceanic Processes and Sedimentation: From Coastlines to the Abyss</b>					
<b>Lec.</b>	<b>Day</b>	<b>Date</b>	<b>Topic</b>	<b>Reading</b>	<b>Instructor</b>
17	Tu	19-Oct	Introduction to Part II: Global Inputs/Weathering	Supplemental	CRG
18	Th	21-Oct	Near Shore Processes (beaches, estuaries, deltas)	Supplemental	CRG
19	Th	26-Oct	Near Shore Processes (continued)	Supplemental	CRG
20	Th	28-Oct	Reefs and Shallow Water Carbonate Complexes	Supplemental	CRG
21	Tu	2-Nov	Quaternary Sea Level and Modern Shelf Systems	Supplemental	CRG
22	Th	4-Nov	Building Continental Margins: Sea Level & Seismic Sequence Stratigraphy	Supplemental	CRG
23	Tu	9-Nov	Deep Sea Canyons, Turbidity Currents	Supplemental	CRG
24	Th	11-Nov	<i>Veterans Day (no class)</i>	-	-
25	Tu	16-Nov	Turbidites, Slumps, Submarine Fans	Supplemental	CRG
26	Th	18-Nov	Ocean Circulation / Contourites / Deep-Sea Clays	Supplemental	CRG
27	Tu	23-Nov	Deep Sea Biogenic Oceanic Sediments	Supplemental	CRG
28	Th	25-Nov	<i>Thanksgiving Holiday (no class)</i>	-	-
29	Tu	30-Nov	Deep Sea Biogenic Oceanic Sediments	Supplemental	CRG
30	Th	2-Dec	Authigenic Sediments	Supplemental	CRG
31	Tu	7-Dec	Upwelling Sediments (Corg-Si-P) & Sediment Diagenesis	Supplemental	CRG
32	Th	9-Dec	Cenozoic Paleooceanography/Orbital Forcing (last day instruction)	Supplemental	CRG
32	Th	14-Dec	<b>2nd EXAM on Part II (only)</b> <b><u>Thursday, Dec 14, 12:00-2:00pm</u></b>		CRG

## **Learning Objectives:**

The Department of Earth Sciences has five overall Student Learning Objectives (SLOs) related to the Bachelors Degree in Earth Sciences. This course's objectives encompass three levels of maturity in all five of these categories\*:

1. Students can explain the relevance of geology and geophysics to human needs, including those appropriate to Hawaii, and be able to discuss issues related to geology and its impact on society and planet Earth.
2. Students can apply technical knowledge of relevant computer applications, laboratory methods, field methods, and the supporting disciplines (math, physics, chemistry, biology) to solve real-world problems in geology and geophysics.
3. Students use the scientific method to define, critically analyze, and solve a problem in earth science.
4. Students can reconstruct, clearly and ethically, geological knowledge in both oral presentations and written reports.
5. Students can evaluate, interpret, and summarize the basic principles of geology and geophysics, including the fundamental tenets of the sub-disciplines, and their context in relationship to other core sciences, to explain complex phenomena in geology and geophysics.

\* [http://www.soest.hawaii.edu/GG/resources/docs/gg-undergrad-SLO\\_Master\\_Checklist\\_Final.pdf](http://www.soest.hawaii.edu/GG/resources/docs/gg-undergrad-SLO_Master_Checklist_Final.pdf)

## **Student Resources and Assistance:**

### **Disability Access:**

If you have a disability and related access needs the Department will make every effort to assist and support you. For confidential services students are encouraged to contact the Office for Students with Disabilities (known as “Kokua”) located on the ground floor (Room 013) of the Queen Lili'uokalani Center for Student Services: KOKUA Program; 2600 Campus Road; Honolulu, Hawaii 96822 Voice: 956-7511; Email: [kokua@hawaii.edu](mailto:kokua@hawaii.edu); URL: [www.hawaii.edu/kokua](http://www.hawaii.edu/kokua)

### **Title IX:**

The University of Hawai'i is committed to providing a learning, working and living environment that promotes personal integrity, civility, and mutual respect and is free of all forms of sex discrimination and gender-based violence, including sexual assault, sexual harassment, gender-based harassment, domestic violence, dating violence, and stalking. If you or someone you know is experiencing any of these, the University has staff and resources on your campus to support and assist you. Staff can also direct you to resources that are in the community. Here are some of your options:

As members of the University faculty, your instructors are required to immediately report any incident of potential sex discrimination or gender-based violence to the campus Title IX Coordinator. Although the Title IX Coordinator and your instructors cannot guarantee confidentiality, you will still have options about how your case will be handled. Our goal is to make sure you are aware of the range of options available to you and have access to the resources and support you need.

If you wish to remain ANONYMOUS, speak with someone CONFIDENTIALLY, or would like to receive information and support in a CONFIDENTIAL setting, use the confidential resources available here: <http://www.manoa.hawaii.edu/titleix/resources.html#confidential>

If you wish to directly REPORT an incident of sex discrimination or gender-based violence including sexual assault, sexual harassment, gender-based harassment, domestic violence, dating violence or stalking as well as receive information and support, contact: Dee Uwono Title IX Coordinator (808) 956-2299 [t9uhm@hawaii.edu](mailto:t9uhm@hawaii.edu).

**From the UH Basic Needs Group:**

*"Basic needs include food and housing, childcare, mental health, financial resources and transportation, among others. Student basic needs security is critical for ensuring strong academic performance, persistence and graduation and overall student well being. If you or someone you know is experiencing basic needs insecurity, please see the following resources: <https://www.hawaii.edu/student-basic-needs/resources/manoa/>".*