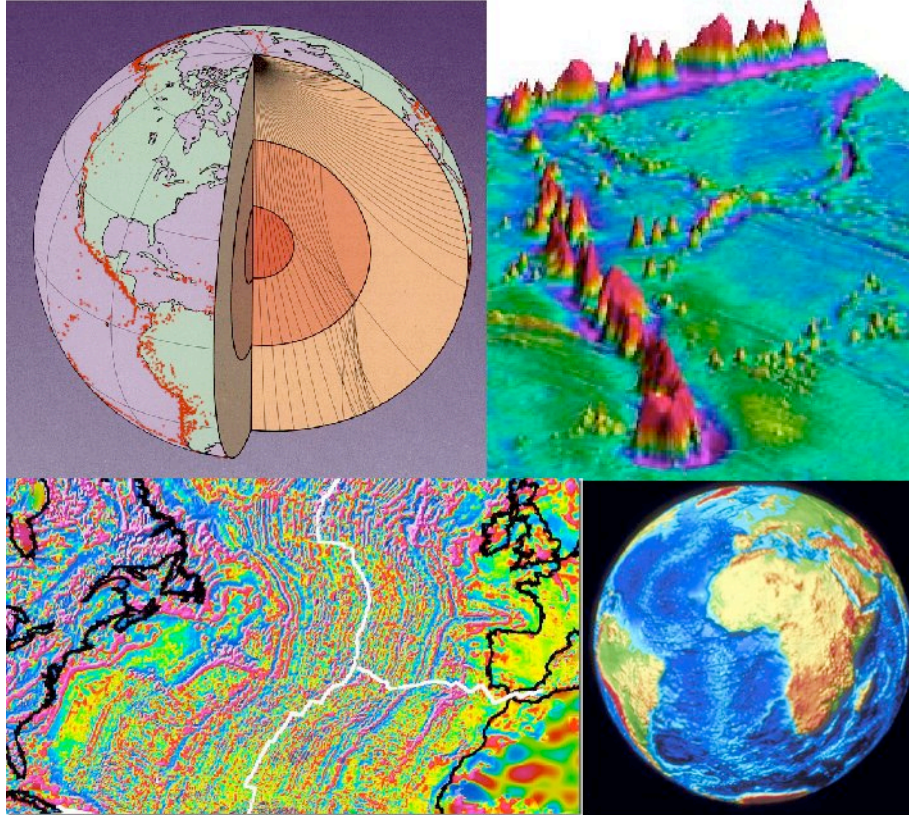


Department of Geology & Geophysics, Spring 2011

## GG304: Physics of the Earth and Planets



**Instructors:**

**Clint Conrad  
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office hours: after class, by appointment**

**Lectures:** **Tues. & Thur. 9:00-10:15 in 703 POST**

**Lab:** **Mondays 1:30-4:20 in 733 POST**

**Texts:** **Fundamentals of Geophysics, by W. Lowrie**

**Web Site:** [www.soest.hawaii.edu/GG/FACULTY/conrad/classes/GG304/GG304.html](http://www.soest.hawaii.edu/GG/FACULTY/conrad/classes/GG304/GG304.html)

The Earth's shape, orbit, interior structure, and geological evolution are all the result of the interaction between Earth's materials and the physical laws of gravity, electromagnetism, and heat flow. In this class we will explore these interactions to understand the basic physics of the Earth and other planets. We will achieve this by examining and utilizing observations of gravity, geomagnetism, heat flow, and seismic wave propagation.

**Preliminary Schedule:**

Week	Days	Lecture Topic	Lab Topic	Reading
1	Jan 10		No Lab (Introduction)	
	Jan 11, 13	Planets and Orbits		
2	Jan 17		No Lab (MLK Holiday)	
	Jan 18, 20	Potential and Tides		
3	Jan 24		Lab 1: Matlab & Planetary Orbits	
	Jan 25, 26	Earth's Figure and Geoid		
4	Jan 31		Lab 2: Vectors and Orbits	
	Feb 1, 3	Gravity		
5	Feb 7		Lab 3: Gravity Survey	
	Feb 8	Review		
	Feb 10	<b>MIDTERM 1</b>		
6	Feb 14		Lab 4: Gravity Anomalies	
	Feb 15, 17	Geomagnetism		
7	CRUISE: Bathymetry, Gravity & Magnetics of a proposed Mohole drill site NE of Oahu Shiptime: Feb 19 8:00 AM to Feb 23 8:00 AM (4 days)			
	Feb 23	Cruise Discussion		
8	Feb 28		Lab 5: Magnetics	
	Mar 1, 3	Heat Flow		
9	Mar 7		Lab 6: Cruise Results	
	Mar 8, 10	Geotherms		
10	Mar 14		No Lab	
	Mar 15	Review		
	Mar 17	<b>MIDTERM 2</b>		
SPRING BREAK: March 21-25				
11	Mar 28		No Lab	
	Mar 29, 31	Seismic Waves		
12	Apr 4		Lab 7: Seismic survey	
	Apr 5, 7	Earthquake Seismology		
13	Apr 11		Lab 8: Seismology I	
	Apr 12, 14	Global Seismology		
14	Apr 18		Lab 9: Seismology II	
	Apr 19, 21	Reflection Seismology		
15	Apr 25		Lab 10: Reflection seismology	
	Apr 26, 28	Internal Structure of the Earth		
16	May 2		No Lab	
	May 3	Review for Exam		
17	May 10	<b>MIDTERM 3</b>	9:45 to 11:45 AM	

## Grading and Assignments

### Grading:

We will have homework, lab assignments, two in-class midterms, and one final exam. The relative weightings of homework, lab assignments, exams, and class participation are:

Midterms & Final	30%
Homework Assignments	30%
Laboratory Assignments	30%
Class Participation	10%
Total	100%

**Assignments:** Homework and Lab assignments will be assigned approximately weekly, and are due at the beginning of class exactly 1 week after they are assigned (unless otherwise stated - the due date will be stated on the assignment).

**Format:** Neatness, clarity of expression, and completeness are essential to obtain full credit on exams, labs, and homework. Please make sure to:

- (1) Write out the equations, or derive new ones, that you will use to solve the problem, and explain (in words) your reasoning. Specify known and unknown information.
- (2) Draw illustrative figures that describe the problem.
- (3) Show clearly how you solved the problem.
- (4) Check your answer – does your solution make physical sense? Check units. Explain why you think your answer is correct.

**Lab Write-ups:** Follow the instructions on the lab, and make sure that your lab is clear. Also:

- (1) *Matlab Codes.* Include a copy of your code at the end of your lab write-up, but don't bury the answers to the questions within the code. What you did should be clear from your lab write-up – don't expect a reader to pick through your code.
- (2) *Completeness.* How much detail to include? A good rule of thumb is to include just enough information so that a reader could take your data and reproduce what you did using the information that you provide. Be concise and complete. (This is a good rule of thumb for scientific writing in general.)
- (3) *Format.* Your lab write-up should consist of neatly written answers to the questions, in the order in which they are asked. Please do not skip sections or intersperse your answers to questions with code. Later in the course, we will be asking you to present your results with in the proper format for scientific writing – with labeled sections “Introduction”, “Methods”, “Results”, and “Discussion and Conclusions”.
- (4) *Figures:* All figures that you include should be clearly labeled (Fig. 1., Fig. 2A, Fig. 2B, etc.) and these labels should be used when referring to the figure in the text. Figures should be clearly labeled on their axes, and multiple lines included in the same plot should be clearly distinguished by labels or legends. Please including units in your labels. It is ok to handwrite axes labels and Figure names, but they should be neat and clear.

**Cooperation:** Collaboration is encouraged in order to discuss approaches to solving problems. However, do not copy answers to problem sets – work out the solutions yourself.

**Grace Days:** Each student can utilize 3 “grace days” during the semester. These are days for which there is no penalty for submitting a late assignment. You can use all three to turn in one assignment 3 days late, or you may turn in 3 assignments 1 day late.

**Late Assignments:** After you use your grace days, your homework grade will be reduced by **20% for each working day** that the assignment is late (thus, 1 week late = 0 credit).

**Questions:** Questions are welcome and help learning. Please ask questions freely!

## Student Cruise

This course will include a student cruise on the Kilo Moana to a proposed Mohole drill site northeast of Oahu over President’s Day weekend. We will be collecting bathymetry, magnetic, gravity data that we will analyze in a lab exercise later in the class. The Kilo Moana will depart on Saturday Feb 19 at 8:00 AM and will return by 8:00 AM on Wednesday, Feb. 23.

## Learning Objectives

The **Department of Geology & Geophysics** has established the following undergraduate student learning objectives. All of these objectives are relevant targets for the curriculum of GG304.

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, and field methods 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.

## 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)