GG 103  GEOL OGY OF THE HAWAIIAN ISLANDS
Three Credits
Tues. & Thurs., 11:15 – 12:30
Mon., 1730-2015

INSTRUCTOR: Dr. Floyd W. McCoy
OFFICE: Hale Imiloa 115
OFFICE HOURS: Mon. & Wed., 1030-1230; Mon., 1630 - 1730
TELEPHONE: 236.9115
EFFECTIVE DATE: Spring, 2011

WINDWARD COMMUNITY COLLEGE MISSION STATEMENT

Windward Community College is committed to excellence in the liberal arts and career development; we support and challenge individuals to develop skills, fulfill their potential, enrich their lives, and become contributing, culturally aware members of our community.

CATALOG DESCRIPTION

Hawaiian geology and geological processes: origin of Hawaiian Islands, volcanism, rocks and minerals, land forms, stream and coastal processes, landslides, earthquakes and tsunamis, ground water, geological and environmental hazards. Field trips arranged. (3 hrs. lect.) WCC:DP

Additional Activities Required Outside of Class

Additional resources besides the textbook are needed such as a series of color brochures, books and magazines in the WCC library, in addition to websites and other sources – these will be discussed and identified in class.

STUDENT LEARNING OUTCOMES

Your learning outcomes from successfully completing this course are:

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.

Na pelepele nna pali o Kalalau
i kawili o ka makani

The cliffs of Kalalau are crumbling because of stirring by the winds
To be ignorant of what occurred before you were born is to always remain a child…  
[Marcus Tullius Cicero, Roman statesman, orator, senator, philosopher: 106 – 43 BCE]

## COURSE CONTENT

### Concepts or Topics
- Structure of the earth
- Plate tectonics
- Hot spot/midplate volcanoes
- Geography of Hawaiian volcanoes
- Structure of Hawaiian volcanoes
- Rocks and minerals
- Extrusive and intrusive igneous
- Hawaiian-type eruptions
- Predicting Hawaiian eruptions
- Types and classification of igneous rocks
- Formation & crystallization of igneous rocks
- Types of eruptions
- Stages of Hawaiian volc. & island evolution
- Geologic history of Oahu
- Mechanical and chemical weathering
- Ground water
- Mass wasting; aeolian processes
- Glaciers, glaciation and sea-level changes
- Landscape evolution; geomorphic cycle
- Rock cycle
- Absolute and relative dating
- Age of the Hawaiian Islands
- Geologic time
- Volc. hazards: identification, management, mitigation

### Skills or Competencies
- 1. Understand the scientific method, and how it is used and applied.
- 2. Understand the metric system.
- 3. Apply an understanding of physical, chemical, and biological processes to interpreting geological events and processes.
- 4. Use basic mathematical statements to describe geological properties and processes.
- 5. Distinguish and reject faux science and misrepresentations of science.
- 6. Appreciate the technology behind the science of geology.
- 7. Develop an appreciation for geology and rocks good for jocks.
- 8. Appreciate the spectrum of science and engineering endeavors that underlie the study of the earth.
- 9. Appreciate the history, literature, music, and mythology of the earth.
- 10. Comprehend the benefits and dangers of volcanism to society, and the mitigation of geological hazards.

## COURSE TASKS, ASSESSMENT AND GRADING

### Type of examination:
written; questions require essays of varying length from short (single sentence) to longer (no more than a 10 minute composition); some questions may involve the use of maps and cross-sections.

### Examination schedule:
- **One midterm:** 1 hour, covering all material discussed up to the examination date; if this examination is not taken on schedule, a make-up exam. can be given but will have different and more difficult questions.
- **Final exam.:** 2 hours, concerned with the entire course, with some emphasis on the last half of the course; must be taken on scheduled date – no retakes or early takes are possible except in exceptional cases.
- **Extra/special credit:** discouraged; none routinely awarded; no term papers are required; under unusual circumstances, extra/special credit might be devised via consultation with the instructor.

### Grading scheme:
letter grades calculated from an average of all test scores, with the midterm = 40%, and the final = 60% of the total grade; letter grades assigned with:
- A = 90 - 100%
- B = 80 - 89%
- C = 70 - 79%
- D = 60 - 69%
- F = < 60%
- N = course not completed due to unforeseen difficulties
- C/NC = credit/no credit option, assigned only via registration
- I = incomplete due to unusual circumstances; assigned only with permission of the instructor; no credit given until this grade is changed to an A-D letter grade - it is your responsibility to make this change.
"Civilization occurs with the consent of geology."
[Will Durant, American historian]

**LEARNING RESOURCES (aka TEXTBOOK)**

*note: the books listed below remain basic sources of information concerning the geology of Hawaii but are considerably out-of-date – there is no adequate textbook for this course that discusses current concepts and research on Hawaiian volcanism and the processes of constructing a Hawaiian island.*


Four brochures discussing aspects of Oahu geology are posted in the classroom – you are encouraged to consult them as well (see schedule of lectures [below] for correlation to subjects being discussed in class. Supplementary, non-required reading is in libraries at all campuses, both on reserve and on open shelves; you are encouraged to peruse this literature; numerous seminars, talks, symposia and exhibits occur throughout the university system and at various museums, you are particularly encouraged and welcomed to these; announcements made in class, posted on the Marine Option Program bulletin board in Hale 'Imiloa at WCC, or listed on the website; posters depicting various aspects of geology and field trips are on bulletin boards in the Hale 'Imiloa hallway.

**ADDITIONAL INFORMATION**

**Field Trips:** Not required but highly recommended; 1 credit awarded for each course; to obtain credit for neighborhood island field trips, you must participate on every day of the trip, pass a written final examination, and submit a report on the field exercise; the Oahu field-trip course has different requirements that are noted below; complete course descriptions are given in the WCC catalog and on the WCC website. Each course involves a one-day field exercise, with data analyses done after the trip, and a complete report submitted prior to the end of the semester.

**GG 210 – Oahu Field Geology:** every fall semester; Wednesday afternoons, 1330–1615, meet in Hale 'Imiloa Building (WCC) or at field site; short, easy hikes throughout the island to observe, discuss and map geologic features, field activities are mixed with laboratory exercises; transportation to field sites via private cars; course grade is a function of participation on fieldtrips and satisfactory completion of laboratory exercises [next offered fall, 2010].

**GG 211 – Big Island Field Geology:** every fall semester; four days during either Veteran's Day week-end or Thanksgiving Day week-end; involves short hikes and two difficult hikes (onto lava flows and on Mauna Kea), with one day on the summit of Mauna Kea (a harsh, cold, high-altitude environment) [next offered fall, 2009].

**GG 212 – Maui Field Geology:** spring semester, 2013; during first four days of spring recess; may involve a difficult one-day hike into Haleakala; also may involve field lab. exercise in difficult terrain.

**GG 213 – Molokai, Lanai and Kaho'olawe Field Geology:** spring semester, 2011; during first five days of spring recess; involves hiking down to Kalaupapa with a day hike around the Kalaupapa peninsula, and four-wheel driving on rough roads on Lanai; also involves field lab. exercise(s) in difficult terrain.

**GG 214 – Kauai and Ni'ihau Field Geology:** spring semester, 2012; first four days of spring recess; involves short easy hikes; also involves field lab. exercises.

*Note: All field classes require medical clearance and legal waiver forms; all involve hiking over irregular ground and can be difficult with potentially dangerous conditions; students are responsible for their expenses during the trip including transportation.*
**Ke pahu nei ka honua. The earth rumbles and explodes.**

Schedule of lectures and corresponding chapters in the textbook:

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<tr>
<th>Week</th>
<th>Subject</th>
<th>Chapter(s)*</th>
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<td>Introduction to course; geology as a science; scale, rates and time; metric system, Marine Option Program (MOP)</td>
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<tr>
<td></td>
<td>Structure of the earth</td>
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<td>2</td>
<td>Structure of the earth (continued)</td>
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<td></td>
<td>Plate tectonics</td>
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<td>3</td>
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<td>Geography of Hawaiian volcanoes</td>
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<tr>
<td>4</td>
<td>Structure of Hawaiian volcanoes</td>
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<td></td>
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<td>Extrusive and intrusive igneous rocks (continued)</td>
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<td>Extrusive igneous rocks: lava flows</td>
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<td>Predicting Hawaiian Eruptions</td>
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<td>Types and classification of igneous rocks</td>
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<td>Formation and crystallization of igneous rocks</td>
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<td>8</td>
<td>Types of eruptions</td>
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<td>9</td>
<td>Review</td>
<td>1-13, 16-18, HB, KC, DH</td>
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<td>10</td>
<td>Stages of Hawaiian volcanism and island evolution</td>
<td>7-9, 10, HB, KC, MP, DH</td>
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<td>---------------------------- Spring recess GG213 Molokai, Kahoolawe, &amp; Lanai geology field course</td>
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<td>11</td>
<td>Geologic history of Oahu</td>
<td>7-9, HB</td>
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<td>Mechanical and chemical weathering</td>
<td>DH</td>
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<tr>
<td>16</td>
<td>Volcanic hazards: identification, management, mitigation</td>
<td>15-18</td>
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**Note:** Schedule of lectures is tentative and likely will change as geologic events occur during the semester.

* Brochures: DH = Diamond Head; HB = Hanauma Bay; KC = Koko Crater; MP = Makapu’u Point
You Might Be a Geologist If ...

1. You own more pieces of quartz than underwear.
2. Your rock collection weighs more than you do.
3. Your rock garden is located inside your house.
4. You can pronounce the word "molybdenite" correctly on the first try.
5. You don't think of "cleavage" the same way everyone else does.
6. You have ever uttered the phrase "have you tried licking it" with no sexual connotations involved.
7. You think the primary function of road cuts is tourist attractions.
8. You find yourself compelled to examine individual rocks in driveway gravel.
9. You're planning on using a pick and shovel while you're on vacation.
10. Your internet home page has pictures of your rocks.
11. You will walk across eight lanes of freeway traffic to see if the outcrop on the other side of the highway is the same type of rock as the side you're parked on.
12. You can point out where Tsumeb is on a world globe.
13. The baggage handlers at the airport know you by name and refuse to help with your luggage.
14. You have ever found yourself trying to explain to airport security that a rock hammer isn't really a weapon.
15. You never throw away anything.
16. You have ever taken a 22-passenger van over "roads" that were really intended only for cattle.
17. You consider a "recent event" to be anything that has happened in the last hundred thousand years.
18. You have ever had to respond "yes" to the question, "What have you got in here, rocks?"

Geologists are amazing. They know hundreds of words for different sorts of dirt and hundreds of words for things it does when left alone for a few million years.