Geology 1 (#72086) – Physical Geology

Pasadena City College

Fall 2016 Syllabus - Dr. Shadman, Associate Professor

2:00 PM - 5:10 PM (M,W) in E205

### **Purpose of this Course:**

The purpose of this course is to provide you with a basic understanding of the chemistry and physics of the earth, show the dynamic nature of our planet, and to familiarize you with geological terminology and the scientific method.

Geology is truly a science that is best learned "in the field" rather than in the classroom. A wonderful complement to this course is Geol 1F, a course that assumes you are currently (or have previously been) enrolled in Geol 1. It involves 4 days of field study…and that is it! It is a lot of fun and highly recommended.

# Prerequisites:

There are no prerequisites for this course. Concurrent enrollment in Geology 1F is highly recommended.

**Required Materials (all available at PCC Bookstore):**

* **Textbook:** Essentials of Geology (5th Edition) by S. Marshak, W. W. Norton & Company, Inc., © 2016.
* **In-House Course Notes:** Dr. Shadman’s lecture notes (revised Fall 2016). Please put this into a 3-ring binder and BRING TO EACH CLASS MEETING.
* **In-House Laboratory Manual:** Laboratory Assignments and Exercises (revised Spring 2016). BRING TO EACH CLASS MEETING.
* **Internet access outside of class:** On-line homework and quizzes will be given through Canvas.
* **Other Required Materials (\*bring to each class):**
* **\***Basic Calculator - usually < $5 (no, you cannot use your cell phone)
* **\***Colored pencils (at least six colors)
* **\***3-ring binders for course notes and lab manual
* **\***Metric/English scale (ruler)
* Scantron form (882-e) for examinations
* Handlens (available through Geology Office at E215 for $7)

**Instructor Information:**

**Dr. Elizabeth Shadman,** Geology Department, Natural Science Division

Office: E210D

Office Hours: Mondays (11:00 AM – 12:30 PM)

Tuesdays, Thursdays (10:30 AM – 12:30 PM)

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🌍🌏🌎 A special note about e-mailing the professor 🌍🌏🌎

Whenever possible, please communicate with me personally before or after class or during office hours. Be aware that I generally check my e-mail only Mondays through Fridays. Please respect the following guidelines regarding e-mail:

* E-mail should be used for the following:
  + to alert me when you will be absent from class
  + to alert me that you are confused about a concept and would like me to discuss it at the next class session
  + to communicate a personal concern
* E-mail should \***not**\* be used to ask me:
  + to write you a summary of a 3-hour class session you missed
  + to re-teach a concept online
  + to give you a due date that can be found in our syllabus

**Evaluation and Grading:**

Grades will be assigned on the basis of the total possible points that you accumulate over the semester. Points will be allocated in the following manner (details on following pages):

Laboratory Assignments (19 x 10 pts each) 190 (19%)

On-line homework 100 (10%)

Weekly Quizzes (10 x 15 pts each) 150 (15%)

Two Midterm Lecture Exams (2 x 80 pts) 160 (16%)

Two Class Projects (2 x 75 pts) 150 (15%)

Final Exam 150 (15%)

Class notebook 50 (5%)

Punctuality, attendance, effort 50 (5%)

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TOTAL 1000 points

**Extra Credit +20**

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***TOTAL POSSIBLE 1020 points***

Letter grades are assigned as follows for final course grade:

A (900-1025 points)

B (800-899 points) D (600-699 points)

C (700-799 points) F (≤ 599 points)

**Geology 1 Grade Details**

**Laboratory Assignments (190 points):** You will be required to complete 19 laboratory assignments during the semester, each of which is worth 10 points. Successful completion of this material is critical for your success in this class! Labs are due at the beginning of the following class period. If you miss a lab, you are still responsible for the content for quizzes and exams. The lab grading policy is quite straightforward:

Lab is complete and on time: GRADE 🡪 10 points

Lab is incomplete or late: GRADE 🡪 0 points

You are absent and miss a lab: GRADE 🡪 0 points

### **NOTE:** There are facilities available for working on the labs outside of class time in room E210, where mineral and rock sets are available.

**SECOND NOTE:** I apologize in advance for the fact that we will not be going in order in the lab manual. In fact, we will jump around quite a bit. All lab information is given clearly on the semester schedule (pages 6-8).

**On-line Homework (100 points total):** Throughout the semester there will be open-book/note online homework assignments to complete prior to class. Homework is not timed but each assignment does have a due date. The purpose of the homework is to get you familiar with the material that will be discussed in the upcoming class.

### **On-line Quizzes (150 points total):** Eleven short, open note quizzes (15 points each) covering reading and lecture material will be given on-line throughout the semester, roughly once per week, using Canvas. The date at which each quiz “**closes**” is given in the semester schedule (pages 6-8). All quizzes close at **noon** on the closing day. Each quiz will be “**open**” for four days (96 hours) prior to the closing date. Once you begin a quiz, you have 25 minutes to complete it. *Your lowest quiz grade will be dropped*.

### **Two Midterm Lecture Exams (160 points total)**: There will be two in-class, closed note, midterm exams (80 points each) during the semester as shown on the semester schedule (pages 6-8). The exams will include multiple choice and short answer questions, and some may require simple sketches. The exams will emphasize material presented in lecture, but may include some questions taken from the assigned reading (which generally supports the lecture).

*NO MAKE-UP EXAMS* will be given unless arranged ahead of time with the instructor (at least one week prior to exam date) AND taken prior to the class’s scheduled exam date. If something unavoidable and legitimate occurs last minute and you miss the exam, be prepared to take a different and more challenging make-up version of the exam (essay-style).

**Two Class Projects (150 points total; 75 points each)**: There will be two short class projects during the semester. You will summarize your findings in written, 3-4-page reports (plus bibliography). Additional details will be given in class. These are not group projects.

* Project 1: **Seismic Hazard Analysis.** You will conduct a regional seismic hazard analysis of an area in southern California with known, active faults.
* Project 2: **From Grid to Home.** This project focuses on how your electricity is generated and distributed to your home. You will analyze energy use, cost, and source patterns from household to regional scales and relate these patterns to CO2 emissions.

**Final Exam (150 points)**: A final exam will be given during the final exam period and may include some rock identification. The final exam will be cumulative but will emphasize material from the last third of the courses.

**Class Notebook (50 points):** On the day of the final exam, you will be expected to hand in a notebook (3-ring binder) containing the laboratory manual (with graded work in the correct locations) and other handouts, etc. that you have accumulated during the semester. Use **dividers (with headings)** to separate each of the following 7 sections: Syllabus, Daily Starters, Course Notes, Handouts, Laboratory Assignments, Semester Projects, and Exams.

**Punctuality, Attendance, Effort (50 points):** You are expected to arrive to class on time. Class starts exactly at 2:00 PM. Daily attendance and tardiness will be recorded. You will get **two “free” tardies** but after that each tardy will result in 5 points removed from this grade. If you exhaust these points in that manner, points will then be similarly taken from the effort and attitude grade. If you **are absent during 3 consecutive classes** without contacting the professor, you may be dropped. However, it is your responsibility to drop if you do not wish to continue in the course. Additionally, as a member of this class you are expected to exhibit a pleasant attitude, come to class prepared, turn in assignments on time and neatly completed, and contribute substantially to group assignments.

**Extra Credit (20 points):** There is one opportunity for extra credit, **which can add up to 20 points to your final grade**. The assignment is an earthquake preparedness activity that will be described in class. The **due** **date** for this assignment, which includes bringing an earthquake kit to class, is the last day of instruction: **Wednesday, December 7, 2016.**

**Additional Information**

**Field Trip to Eaton Canyon:** There will be one in-class field trip during the semester as indicated in the semester schedule (pages 6-8). You are expected to attend this meeting and submit a short summary of our work that day, due the following class meeting. The summary will count as one of your homework assignments. We will plan to meet at the site at 2:10 PM and will depart from the site by 5:00 PM. Directions and additional details will be given in class.

**If You Miss A Class Meeting:** *You* are responsible for obtaining all material discussed and handed out, *not* the instructor. Please let the instructor know if you already know that you are going to miss an *upcoming* class date. You will receive 0 points if you miss a lab, which is likely because we do labs every class period.

**Electronic Equipment:** Cell phone, ipod, and internet use *during lecture* disrupts the class and disturbs your classmates. There will be lecture breaks and laboratory time when these items can be used. Cell phones cannot be used as calculators on exams.

**Obligations to Each Other**

My obligations to you are:

* to arrive at each class meeting well-prepared and on time,
* to explain course material clearly, and be receptive to receiving and patient in answering questions,
* to be available for additional help during office hours and over e-mail (but not one day before an exam!),
* to fully inform you of the class expectations/requirements, and
* to evaluate you objectively and fairly.

Your obligations to yourself and your classmates are:

* to arrive at each class meeting well-prepared and on time,
* to be courteous and respectful to others,
* to contribute a fair share of effort to collaborative assignments, and
* to be aware that you are principally responsible for your achievements in this class.

**Fall 2016 – SEMESTER SCHEDULE – Physical Geology**

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| **Date** | **Topic** | **BEFORE CLASS READ Book/Lab**  ***(Page numbers)*** | **Laboratory Activity**  **(Due at beginning of**  **next class)** | **On-line Quizzes**  (available 4 days prior to closing date) |
| 8/29  Laptops | And Just What is Geology?  The Earth in Context | Prelude *(1-9)*  Ch. 1 *(10-27; 36-39)* | Lab #1: Measurement and Geologic Time |  |
| 8/31 | The Way the Earth Works: Plate tectonics | Ch. 2 *(42-69)* | Lab #2: Plate Tectonics |  |
| 9/5 | **CAMPUS CLOSED – LABOR DAY** | | | |
| 9/7 | The Way the Earth Works: Plate tectonics | Ch. 2 *(70-80)* | Lab #2: Plate Tectonics  *(continued)* | **Quiz #1** (Prelude, Ch. 1, and Lab #1)  (*Closed at noon*) |
| 9/12  Laptops | Natural Hazards | Ch. 13*: Sect. 13.1 (440-442), Box 13.1 (446-450), Sect. 13.4 (456-458)* | Lab #7: Map Your Hazards |  |
| 9/14 | Hazards at Transform Plate Boundaries | Read in Lab (30-32; 40-41) | Lab #3: Living on the Edge  Units 1-2 | **Quiz #2** (Ch. 2)  (*Closed at noon*) |
| 9/19 | Hazards at Divergent Plate Boundaries | Read in Lab (48; 50) | Lab #4: Living on the Edge  Units 3-4 |  |
| 9/21 | Hazards at Convergent Plate Boundaries | Read in Lab (59-60; 82-85) | Lab #5: Living on the Edge  Units 5-6 | **Quiz #3** (Ch. 13 and Labs #7 and #3)  (*Closed at noon*) |
| 9/26 | **MOVIE DAY** | | | |
| 9/28 | Stress, strain, faults, and folds | Ch. 9 *(296-276)* | **Exam review** with Lab #8  *Turn in movie notes for extra credit* | **Quiz #4** (Labs 4 and 5)  (*Closed at noon*) |
| 10/3 | **Exam #1**  **(Ch. 1, 3, 9, 13, ALL LAB TOPICS)** | | | |

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| --- | --- | --- | --- | --- |
| **Date** | **Topic** | **BEFORE CLASS READ Book/Lab**  ***(Page numbers)*** | **Laboratory Activity**  **(Due at beginning of**  **next class)** | **On-line Quizzes**  (available 4 days prior to closing date) |
| 10/5 | A Violent Pulse: Earthquakes | Ch. 8 *(244-279)* | Lab #6: Earthquake Analysis (≠Part 6) |  |
| 10/10 | The Earth’s Interior Revisited: Insights from Geophysics | Interlude D *(282-289)* | Lab #6b: California faults (NEW activity, not in the lab manual) |  |
| 10/12 | Patterns in Nature: Minerals | Ch. 3 *(82-99)* | Lab #9: Introduction to Minerals | **Q#5** (Ch. 8, Interlude D, and Labs #6 and #6b)  (*Closed at noon*) |
| 10/17 | People, products, and minerals | Lab (144-154) | Lab #10: Mineral Resources |  |
| 10/19 | How does economics relate to rocks? | Lab (164-166; 168-172)  Ch. 12*: Sect. 12.1 (390-392), Sect. 12.10-12.12 (418-425)* | Lab #11: Mineral Resources |  |
| 10/24 | Rock Groups  Up from the Inferno: Magma and Igneous Rocks | Interlude A (*102-110)*  Ch. 4 *(112-129)* | Lab #13: Igneous Rock Identification | **Q#6** (Ch. 12 and Labs #9 and #10)  (*Closed at noon*) |
| 10/26 | Up from the Inferno: Magma and Igneous Rocks | Ch. 4 *(130-133)* | Lab #13: Igneous Rock Identification *(continued)* |  |
| 10/31 | The Wrath of Vulcan: Volcanic eruptions | Ch. 5 *(136-149)* | **EXAM REVIEW** | **Q#7** (Ch. 4 and Labs #11 and #13)  (*Closed at noon*) |
| 11/2 | **Exam #2**  **(Ch. 3, 4, 5, 8, 12, Interludes A and D, ALL lab topics)** | | | |
| 11/7 | A Surface Veneer: Sediments and Soils | Interlude B *(170-184)* | Lab #14: A Growing Concern |  |
| **Date** | **Topic** | **BEFORE CLASS READ Book/Lab**  ***(Page numbers)*** | **Laboratory Activity**  **(Due at beginning of**  **next class)** | **On-line Quizzes**  (available 4 days prior to closing date) |
| 11/9 | Sustaining soil resources through local decision making | Lab (*232-233*) | Lab #16: A Growing Concern |  |
| 11/14 | Pages of Earth’s Past: Sedimentary rocks | Ch. 6 (186-201) | Lab #17: Sedimentary Rock Identification | **Q#8** (Interlude B and Lab #14)  (*Closed at noon*) |
| 11/16 | Pages of Earth’s Past: Sedimentary rocks | Ch. 6 (201-211) | Lab #17: Sedimentary Rock Identification *(continued)* |  |
| 11/21 | Metamorphism: A Process of Change | Ch. 7 *(214-223)* | Lab #18: Metamorphic Rock Identification | **Q#9** (Ch. 6)  (*Closed at noon*) |
| 11/23 | **Eaton Canyon Field Trip -- Notes & Summary due: 11/28** | | | |
| 11/28 | Metamorphism: A Process of Change | Ch. 7 *(224-232)* | Lab #18: Metamorphic Rock Identification *(continued)* |  |
| 11/30 | Rock Cycle  Ore minerals, mining and mining methods | Interlude C *(210-215)*  Read in Lab *(288-304)*  Review Ch. 12*: Sect. 12.10 and 12.12* | Lab #20: Mineral Resources | **Q#10** (Ch. 7)  (*Closed at noon*) |
| 12/5 | Mineral Resources created by Igneous and Metamorphic processes | Read in Lab (264-281) | Lab #19: Mineral Resources |  |
| 12/7 | **Extra Credit Due** |  | **EXAM REVIEW** | **Q#11** (Labs #19 and #20)  (*Closed 12/2 at noon*) |
| ***FINAL EXAM* (Cumulative, with emphasis on Ch. 6, 7, 12, Interludes B and C, ALL lab topics)**  \*\*Wednesday, December 14, 2016, 1-3 PM\*\*  BRING NOTEBOOK TO FINAL FOR NOTEBOOK CHECK – 50 points | | | | |

**While I encourage you to work together on labs, you should take care to do your OWN WORK and put things into YOUR OWN WORDS. Plagiarism of the text, the lab manual, the web or your classmates’ words WILL to result in an F on the assignment for the first infraction and dismissal from class for the second.**

**Student Learning Outcomes:**

1. Students will be able to synthesize and analyze oral and written information.

2. Students will be able to make empirical observations in a laboratory setting.

3. Students will be able to apply the system approach to Earth science studies.

4. Students will understand and be able to explain theory of plate tectonics.

**Student Goals:**

Upon successful completion of this course, the student will be able to:

1. Identify the common rock-forming and ore minerals on the basis of physical properties, provide reasonable explanations for the genesis of minerals, and explain the importance of ore deposits to man.

2. Identify the common members of the igneous, metamorphic and sedimentary rock families using only a hand lens and pocket knife, provide reasonable explanations for the genesis of common rocks and explain how man utilizes certain rocks in practical ways.

3. Know the geologic time scale, be able to explain how it was assembled through the use of fossils and cross-correlation with radiometrically determined dates, and know and apply relative age dating principles to problems involving geologic chronology to include stratigraphic sequence, faulting, folding and unconformities.

4. Describe how a seismic model of the earth's interior has been assembled from seismological and other geophysical and petrological data.

5. Discuss the general features, causes and processes involved in volcanic and plutonic activity.

6. Explain the origin of earthquakes based upon the elastic rebound theory.

7. Know what steps to take to protect people and properties from death, injury or damage during a destructive earthquake.

8. Explain the theory of plate tectonics in terms of historical development, types of plate boundaries and associated seismic and petrologic characteristics.

9. Understand the classic geomorphic cycles and characteristics that govern erosion under arid and humid conditions, as well as the products that are produced (such as how residual soils form and what their relationship is to prevailing climate)

10. Explain classical shoreline processes both as natural systems and systems impacted by man.

11. Explain the sources and flow of groundwater as well as man’s impact on this resource by overdraft and pollution.

12. Be able to construct and interpret topographic and geologic maps.

13. Explain the general features, courses and processes involved in subaerial and submarine mass movement.

14. Be able to provide 10 examples of the importance of the study of geology to man’s physical, cultural and economic well being.

15. Know how to select a home site in Southern California on the basis of geo-technical considerations

**DAILY STARTERS**

WRITTEN ON BOARD BEFORE EACH CLASS BEGINS

Write a question or two on the board that students are required to copy into their notes and try to answer as everyone gets settled and roll call is taken. Generally I use these to introduce new topics. After students have written their own ideas on paper, they share with one or two classmates and then we have a brief discussion.

DAY 1 – (*Intro*) List 5 geologic hazards that are a concern to society

List 5 natural resources that you use every day

DAY 2 - (*Earth formation*) Put the following objects in order by size (smallest to largest) and name an example of each: (star, galactic cluster, planet, universe, moon, solar system, galaxy)

DAY 3 - (*Absolute geologic time*) What is the age of the earth? Are all parts of the earth the same “age? How are numerical ages known of very old objects?

DAY 4 - (*Plate tectonics*) What causes earthquakes? Can they occur anywhere on earth? Name three places that seem to experience major earthquakes fairly often.

DAY 5 - (*Plate tectonics*) How far do you live from the San Andreas fault? Do you live closer to any other “active” faults?

DAY 6 – (*Earthquakes*) Have you ever felt an earthquake? Describe your experience. List at least 8 types of preparations that would be important for someone who lives in an area where earthquakes are common (for example, keep a supply of flashlights and spare batteries). What are the biggest concerns?

DAY 7 – (E*arth’s interior*) We live on the outer layer of earth: the crust. What are the deeper layers of earth? How do we know the thicknesses and compositions of earth’s interior layers? How deep is the deepest manmade drill hole?

DAY 8 – (E*arth’s system*) Why are there earthquakes? Why do volcanoes erupt?

DAY 9 – (*Deformation*) Write down the names of any three mountains that you can think of…..how did each of these form?

OTHERS – (*Magnetic field*) How does a compass work? Does a compass needle point north or south in Australia?

EXAM #1

DAY 11 – (*Minerals*) Name five things that you have used today that are made from minerals.

DAY 12 – (*Minerals*)

DAY 13 – (*Igneous rocks*) Imagine you are studying a lava lake in Hawaii. The volcanic activity that created the lake stops, and the lake surface hardens. What is that hardened surface made of? What might happen if the volcanic activity begins again?