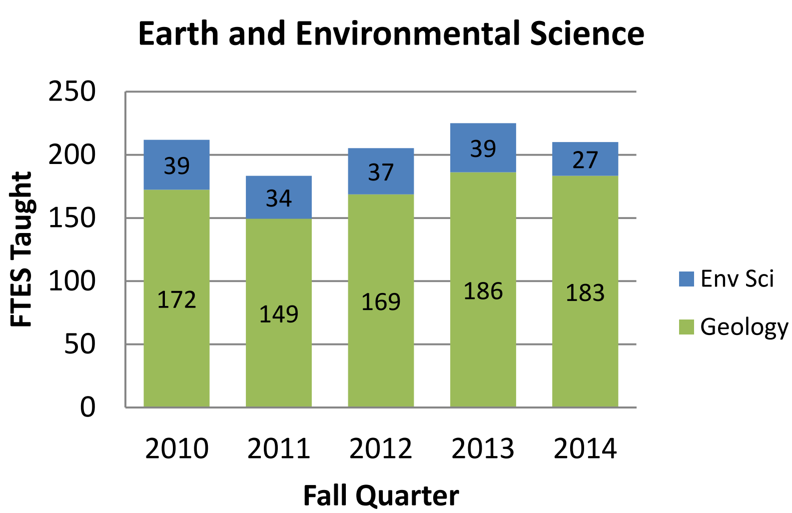
Geology MS Program Annual Report 2014-15

Department of Earth and Environmental Sciences

The Department of Earth and Environmental Sciences in the College of Science offers degrees in Geology (BS, BA, MS) and Environmental Science (BS). The scope of this report is the Geology graduate (MS) program.

Enrollment

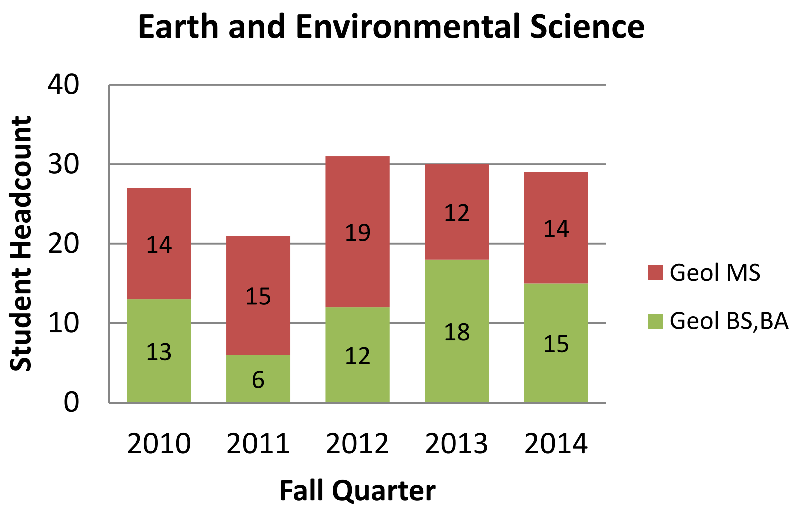
Enrollment in courses offered by the department as measured by Fall Quarter FTES was 210 for 2014 and has been relatively stable during the past two years (see figure below). The majority of the department's FTES are associated with Geology courses. A large portion of the department's enrollment is due to its participation in the General Education (GE) Program. This includes Freshman Learning Communities (clusters) and upper-division GE. The department taught in three GE clusters during AY 2014-15. The department offer a popular online class, GEOL 3401, The Oceans, which has a typical enrollment of about 160 students per quarter (four sections with 40 students each). The class is approved for upper-division Science GE credit.



FTES for courses in Geology and Environmental Science.

Number of Majors

The total number of majors, or student headcount, in the Geology MS program was 14 in Fall 2014. The average number of majors from 2010-2014 was 14.8.



Number of majors in Geology programs, 2010-2014. Number of majors in the Geology MS program are shown in red.

Student Advising

Advising for students in the Geology MS program is provided by the graduate coordinator and the project or thesis advisor.

Faculty

The department has five tenure-track or tenured faculty members; one Assistant Professor, two Associate Professors and two full Professors. Our newest faculty member, Michael Massey, joined the department in Fall 2013. His specialty is Environmental Science, and he serves as the Environmental Science Program Coordinator.

Due to the small number of regular faculty, we utilize ten lecturers to teach a variety of courses, including introductory courses for non-majors as well as upper-division and graduate level courses for majors. Most are part-time and have been teaching in the department for several years. All have at least an MS degree, and seven have a PhD in Geology or a related field.

Staff

The department normally has two staff members, an Administrative Support Assistant and Instructional Support Technician. The ASA provides office support and the technician prepares and maintains materials for labs. The technician position is currently vacant and a search is underway for a replacement.

Assessment

The department updated its assessment plan earlier this year to provide more details on the implementation for Geology MS program for a five-year period through 2017-2018. The revised materials and assessment results for the current academic year, 2014-2015, are attached.

Department of Earth and Environmental Sciences
California State University, East Bay

ASSESSMENT REPORT 2014-15

GEOLOGY M.S.

28 June 2015

Department of Earth and Environmental Sciences
California State University, East Bay

Assessment Results 2014-15
Geology M.S.

Contents

Department of Earth and Environmental Sciences
California State University, East Bay

Geology M.S. Program Learning Outcomes

Students graduating with an M.S. in Geology from Cal State East Bay will be able to:

1. attain an advanced understanding of the relationship between geologic materials and their physical and chemical properties. (Geologic Materials)

2. collect, analyze, and interpret data using advanced discipline-specific methods, techniques, and equipment. (Data & Analysis)

3. critically analyze geological and environmental issues through the evaluation of current scientific literature, and present an argument clearly and persuasively in written and oral form. (Communication)

4. conduct geologic research, including preparation of a project or thesis; the result should be of high enough quality to be presented at a professional meeting. (Research)

5. understand geologic time, evolution, Earth's place in the Universe, and global-scale processes such as plate tectonics, earth systems interactions, and climate change. (Geologic Time)

Department of Earth and Environmental Sciences
California State University, East Bay

Geology M.S. Program ILO Alignment Matrix

The table below shows which Institutional Learning Outcomes (ILOs) are addressed by each of the Program Learning Outcomes (PLOs) listed above.

	MS PLO 1 Geologic Materials	MS PLO 2 Data Analysis	MS PLO 3 Communication	MS PLO 4 Research	MS PLO 5 Geologic Time
ILO 1: Thinking & Reasoning	X	X	X	X	X
ILO 2: Communication			X	X	
ILO 3: Diversity			X		X
ILO 4: Collaboration		X	X	X	
ILO 5: Sustainability			X		X
ILO 6: Specialized Education	X	X	X	X	X

Curriculum Map for Program Student Learning Outcomes
CSU East Bay, Dept. of Earth & Environmental Sciences
Degree Program: M.S. in Geology

			Program Learning Outcomes				
Field	**Course**	**Title**	**1. Geologic Materials**	**2. Data Analysis**	**3. Communi-cation**	**4. Research**	**5. Geol. Time**
GEOL	6020	Seismic Exploration	P	M			
GEOL	6040	Near Surface Geophysics	P	M			
GEOL	6310	Isotope Geochemistry	I	P	P		M
GEOL	6320	Groundwater	I	M	P		P
GEOL	6411	Engineering Geology	M	M			
GEOL	6414	Earthquake Geology	P		M		M
GEOL	6430	Tectonic Geomorphology	I		P		M
GEOL	6811	Graduate Seminar			M		
GEOL	6899	Project		P	P	M	
GEOL	6910	University Thesis		M	M	M	

Proficiency Levels: I = Introduced; P = Practiced; M = Mastered

CSUEB Geology Programs – LABORATORY SKILLS / COURSE PROJECT RUBRIC

Laboratory skills and course projects and assignments are where the discipline-specific skills, methods, techniques and processes that are fundamental to the Earth Sciences are acquired and utilized.

This rubric or portions of it may be applied to student **laboratory and course assignments** and **projects** in order to assess how well the Geology Program Learning Outcomes have been achieved.

	Exemplary **3**	**Accomplished** **2**	**Competent** **1**	**Insufficient Evidence** **0**
1. Organization	Organization is **clear, consistent, observable** and **skillful** and content is **cohesive**.	Organization is **clear**, **consistent** & **observable**.	Organization is **intermittently observable**.	Organization is **poor** or **not observable**.
2. Presentation	Work is **attractive**, **clean**, **clear**, **accurate**, visually **strong**	Work is **well produced**, **clear**, **mostly-accurate**, visually **effective**	Work is adequate with **minor errors**, visually **inert**	Work is **unclear**, **informal**, **minimally** conveys intent and **error prone**
3. Quantitative Skills	Applied **innovative** and **insightful** mathematical methods and techniques. Demonstrates mathematical **mastery**.	Applied **situation-appropriate** mathematical methods and techniques. Demonstrates **solid** math skills.	Applied **basic** mathematical methods. Demonstrates **modest** math skills.	**Unable** to apply basic mathematical methods and techniques. Insufficient math skills.
4. Execution	Work is complete to levels **above expectation** and turned in **early or on time**	Work is **strong**, **complete** and turned in **on time**	Work is **adequate**, **complete** and turned in **on time**	Work is **incomplete** or not turned in **on time**
5. Connection, Synthesis, Transformation	**Synthesizes** ideas or solutions into a coherent whole. **Creates** connections to higher-level discipline-specific concepts and practices.	**Connects** ideas or solutions in novel ways. **Recognizes** connections to higher-level discipline-specific concepts and practices.	**Acknowledges** existing connections among ideas or solutions.	**No recognition** of significance of exercise to discipline or global context.

Modified from: AAC&U

CSUEB Department of Earth and Environmental Sciences
Programs in Geology and Environmental Science - Quantitative Literacy Rubric

Quantitative Literacy (QL) is competency and comfort in working with numerical data. Individuals with strong QL skills possess the ability to reason and solve quantitative problems from a wide array of contexts and situations.

This rubric may be applied to student assignments that involve all or parts of any of the department's Program Learning Outcomes (PLOs).

	Capstone 4	**Milestone** 2	**Milestone** 1	**Milestone** 0
Interpretation *Ability to explain information presented in mathematical forms (e.g., equations, graphs, diagrams, tables, words)*	Provides accurate explanations of information presented in mathematical forms. Makes appropriate inferences based on that information.	Provides accurate explanations of information presented in mathematical forms.	Provides somewhat accurate explanations of information presented in mathematical forms, but occasionally makes minor errors related to computations or units.	Attempts to explain information presented in mathematical forms, but draws incorrect conclusions about what the information means.
Representation *Ability to convert relevant information into various mathematical forms (e.g., equations, graphs, diagrams, tables, words)*	Skillfully converts relevant information into an insightful mathematical portrayal in a way that contributes to a further or deeper understanding.	Competently converts relevant information into an appropriate and desired mathematical portrayal.	Completes conversion of information but resulting mathematical portrayal is only partially appropriate or accurate.	Completes conversion of information but resulting mathematical portrayal is inappropriate or inaccurate.
Calculation	Calculations attempted are successful and sufficiently comprehensive to solve the problem. Calculations presented clearly and concisely.	Calculations attempted are mostly successful and sufficiently comprehensive to solve the problem.	Calculations attempted are either unsuccessful or represent only a portion of the calculations required to comprehensively solve the problem.	Calculations are attempted but are both unsuccessful and are not comprehensive.
Application / Analysis *Ability to make judgments and draw appropriate conclusions based on the quantitative analysis of data, while recognizing the limits of this analysis*	Uses the quantitative analysis of data as the basis for deep and thoughtful judgments, drawing insightful, carefully qualified conclusions from this work.	Uses the quantitative analysis of data as the basis for competent judgments, drawing reasonable and appropriately qualified conclusions from this work.	Uses the quantitative analysis of data as the basis for workmanlike (without inspiration or nuance, ordinary) judgments, drawing plausible conclusions from this work.	Uses the quantitative analysis of data as the basis for tentative, basic judgments, although is hesitant or uncertain about drawing conclusions from this work.
Assumptions *Ability to make and evaluate important assumptions in estimation, modeling, and data analysis*	Explicitly describes assumptions and provides compelling rationale for each. Shows awareness that confidence in final conclusions is limited by the accuracy of the assumptions.	Explicitly describes assumptions and provides compelling rationale for why assumptions are appropriate.	Explicitly describes assumptions.	Attempts to describe assumptions.
Communication *Expressing quantitative evidence in support of the argument or purpose of the work (in terms of what evidence is used and how it is formatted, presented, and contextualized)*	Uses quantitative information in connection with the argument or purpose of the work, presents it in an effective format, and explicates it with consistently high quality.	Uses quantitative information in connection with the argument or purpose of the work, though data may be presented in a less than completely effective format or some parts of the explication may be uneven.	Uses quantitative information, but does not effectively connect it to the argument or purpose of the work.	Presents an argument for which quantitative evidence is pertinent, but does not provide adequate explicit numerical support.

After American Association of Colleges and Universities, aacu.org

CSUEB Geology M.S. Program - CRITICAL THINKING & WRITING RUBRIC

Critical thinking is a habit of mind characterized by the comprehensive exploration of issues, ideas, artifacts, and events before accepting or formulating an opinion or conclusion. *Written communication* is the development and expression of ideas in writing It can involve working with many different writing technologies, and mixing texts, data, and images.

This rubric may be applied to student writing assignments that involve all or parts of any of the M.S. in Geology Program Learning Outcomes (PLOs).

	Exemplary 3	**Accomplished** 2	**Competent** 1	**Minimal Evidence** 0
1. Context and Purpose *Consideration of audience, purpose (i.e précis, term papers & reports).*	Demonstrates **thorough understanding** of context, audience & purpose. **Completes** assigned tasks.	Demonstrates **adequate understanding** of context, audience & purpose. **Completes** assigned tasks.	Demonstrates **awareness** of context, audience & purpose. **Minimally completes** assigned tasks.	Demonstrates **little or no attention** of context, audience & purpose. **Barely completes or does not complete** assigned tasks.
2. Disciplinary Conventions *Rules for writing in academic fields*	Demonstrates **detailed attention** to organization, content, presentation, formatting, and style.	Demonstrates **consistent attention** to organization, content, presentation, formatting, and style.	Demonstrates **some attention** to, and organization, content, presentation, formatting, and style.	Demonstrates **poor attention** to organization, content, presentation, formatting, and style.
3. Syntax and Mechanics	Uses **graceful** language that **skillfully communicates** meaning to readers with **clarity** and **fluency**, and is virtually **error- free**.	Uses **straightforward** language that **generally conveys meaning** to readers. The language in the portfolio has **few errors**.	Uses language that **generally conveys meaning** to readers with **clarity**, although writing may include **some errors**.	Uses **poor** or **inappropriate** language choices that sometimes **impede meaning** because of **errors in usage**.
4. Explanation of Issues	Issue is **stated clearly** and **described comprehensively,** conveying **full understanding.**	Issue is stated and described clearly with no **serious omissions**.	Issue is stated but leaves some terms **undefined, ambiguities unexplored**.	Issue is stated **without clarification or description**.
5. Evidence *Selecting and using information to investigate a point of view or conclusion*	Information is taken from **appropriate** sources; allows **comprehensive analysis**. Viewpoints of experts are **questioned thoroughly**.	Information is taken from **appropriate** sources; allows **coherent analysis** or synthesis. Viewpoints of experts are **questioned somewhat**.	Information is taken from **mostly appropriate** sources **without coherent analysis** or synthesis. Viewpoints of experts are accepted with **little questioning**.	Information is taken from sources **without any interpretation or evaluation**. Viewpoints of experts are accepted **without question**.

Modified from: Critical Thinking Value Rubric, AAC&U http://www.aacu.org/value/rubrics/WrittenCommunication.cfm

CSUEB Geology M.S. Program - ORAL COMMUNICATION RUBRIC

Oral communication is a prepared, purposeful presentation designed to increase knowledge, to foster understanding, or to promote change in the listeners' attitudes, values, beliefs, or behaviors.

This rubric may be applied to student oral presentation assignments that involve all or parts of the Geology M.S. Program Learning Outcomes #2 (Data Analysis), 3 (Communication), 4 (Research), and 5 (Geologic Time).

	Exemplary 3	**Accomplished** 2	**Competent** 1	**Insufficient Evidence** 0
1. Organization	Organization is **clear, consistent, observable** and **skillful** and content is **cohesive**.	Organization is **clear**, **consistent** & **observable**.	Organization is **intermittently observable**.	Organization is **poor** or **not observable**.
2. Language	Language is **clear**, **accurate**, **compelling**, and **enhances** the **effectiveness** of the presentation, and audience **appropriate**	Language is **clear**, **thoughtful** and supports the effectiveness of the presentation, and audience **appropriate**	Language is **mundane**, **commonplace** and partially supports the effectiveness of the presentation, and audience **appropriate**	Language choice is **unclear**, **informal** and minimally supports effectiveness of presentation. Language in presentation is **not appropriate** to audience.
3. Delivery	Delivery techniques make presentation **compelling**. Speaker appears **polished** and **confident**.	Delivery techniques make presentation **interesting**. Speaker appears **comfortable**.	Delivery techniques make the presentation **understandable**. Speaker appears **tentative**.	Delivery techniques **detract** from the understandability of the presentation. Speaker is **uncomfortable**.
4. Supporting Material	Appropriate type(s) of supporting materials make reference to information or analysis that **significantly supports** the presentation or establishes the presenter's credibility/authority on the topic.	Appropriate type(s) of supporting materials make reference to information or analysis that **generally supports** the presentation or establishes the presenter's credibility/authority on the topic.	Appropriate type(s) of supporting materials make reference to information or analysis that **partially supports** the presentation or establishes the presenter's credibility/authority on the topic.	**Insufficient** supporting materials
5. Central Message	Message is **compelling** (precisely stated, appropriately repeated, memorable, and strongly supported.)	Central message is **clear** and **consistent** with the supporting material.	Central message is **basically understandable** but is not often repeated and is **not memorable**.	Central message can be deduced, but is **not explicitly stated** in the presentation.

Modified from: Oral Communication Value Rubric, AAC&U http://www.aacu.org/value/rubrics/WrittenCommunication.cfm

M.S. Geology Program

Assessment Summaries, 2014-2015

Overview

We evaluated student work from selected courses in the Geology MS Program 2014-2015 to assess how well Program Learning Outcomes (PLOs) were met. PLOs evaluated during this period include 1. Geologic Materials, 4. Communication, and 5. Geologic Time.

GEOL 6040 – Near Surface Geophysics – Fall 2014: Geologic Materials. Homework on Seismology. Students demonstrated proficiency in calculations involving physical properties of geologic materials. The Lab Project rubric was used to evaluate student work. Out of 15 possible, student scores ranged from 8 to 15, with an average of 12.2 and standard deviation of 2.1. All students achieved at least basic competence on the categories assessed. All students attained "accomplished" or "exemplary" rankings in three areas; organization, execution, and presentation. The two areas in which students had the most difficulty were a) quantitative skills and b) connection, synthesis, and transformation. These results indicate the importance of incorporating regular homework assignments designed to develop these skills. In the future, this course will include more assignments of this type.

GEOL 6310 Isotope Geochemistry – Winter 2015: Geologic Time. Homework involving calculations of ages of geologic materials and writing an essay comparing and contrasting different analytic methods. The Quantitative Literacy rubric was used to evaluate student work. Out of 18 possible, overall scores ranged from 4 to 13, with an average of 9.6 and standard deviation of 3.6. Six of nine students who completed the assignment displayed at least the basic level of competency in all areas of quantitative literacy; only three of nine displayed competency at the mastery level in all areas. None displayed an exemplary level in more than one area of quantitative literacy. A thorough mastery of advanced algebra and graphing is an expected pre-requisite for the course, but some students lack the basic preparation and others have the necessary preparation but their quantitative skills are quite rusty. Possible ways to improve learning outcomes for this assignment are: 1) a pre-assignment that gives students practice with advanced algebra skills, 2) recommendations for math tutoring at SCAA for students who do not perform well on a math skills pre-test given on the first day of class, 3) an additional, optional, session where students work on problems with the instructor present. In the future, similar assessment material will be assigned since calculating the age of geologic materials using isotopic data is a key student learning outcome for this course.

GEOL6340 Tectonic Geomorphology - Spring 2015: Written Communication

Final Précis of a Journal Article. This class focused on text readings and lectures initially and later, on individual student presentations in concert with the class reading and summarizing the presented article. These were punctuated every so often by brief (~15 mins) student presentations on some parts of some chapters as well as a longer and more in-depth oral presentation (summarized below) on a suitable topic of their choice. The final assignment was a précis on that same topic.

Course average is 8.3/12, where 4/12 is ‘competent’ and 8/12 is ‘accomplished’. There was one student (#2) who had some language issues that challenged him. Otherwise there was a wide spread of results, ranging from 6-10 out of 12 total. Again, the précis form is an effective tool to address reading comprehension and writing effectiveness. And again, anecdotal evidence and post-class student comments indicate the exercise of writing précis is valuable and will likely be continued in this seminar.

GEOL6340 Tectonic Geomorphology - Spring 2015: Oral Communication

PowerPoint Presentation to Class. Students present the journal article they chose to address and wrote on for their final précis (above).

Course average is 10.6/15, where 5/15 is ‘competent’ and 10/12 is ‘accomplished’. Again there was a non-native English speaker with issues that more stemmed from poor mechanics than speech. Otherwise there was a wide spread of results, ranging from 6-12 out of 15 total. The exercise is important, especially for graduate student about to enter a workforce. We focus on a clear and succinct message, avoiding slang and informality while providing constructive critique in a supportive environment. This exercise will likely continue.

CSUEB Program Assessment
Department of Earth & Environmental Sciences
Program: Geology M.S.
PLO: 1. Geologic Materials
Rubric: Lab Project
Course: GEOL 6040
Quarter: F 2014
Assignment: Seismology

Student	Organization	Presentation	Quantitative Skills	Execution	Connection, Synthesis, Transformation	Total
1	3	3	3	2	2	**13**
2	2	2	3	3	2	**12**
3	2	2	3	2	2	**11**
4	3	3	3	3	3	**15**
5	2	2	1	2	1	**8**
6	3	3	2	2	3	**13**
7	3	3	3	2	3	**14**
8	3	3	2	2	2	**12**
9	3	3	3	2	3	**14**
10	3	2	3	3	3	**14**
11	2	2	3	3	2	**12**
12	2	2	1	2	1	**8**
13	3	2	3	2	3	**13**
14	3	3	2	2	2	**12**

CSUEB Geology M.S., Program Assessment

Rubric: **Quantitative Literacy for PLO 5 (geologic time)**

Course: GEOL 6310 Isotope Geochemistry

Quarter: Winter 15

Assignment: Homework 2 (calculating and interpreting isochrons and comparing dating methods)

Student ID	interpretation	representation	calculation	application/analysis	assumptions	communication	Total
1	3	2	2	2	2	2	13
2	2	3	2	2	1	1	11
3	2	2	2	2	2	2	12
4	2	2	2	2	2	1	11
5	2	2	2	2	2	2	12
6	1	2	2	1	0	1	7
7	0	1	0	1	0	2	4
8	2	3	2	2	1	2	12
9	0	1	0	0	1	2	4

Notes: one student did not turn in the assignment

CSUEB Geology M.S. Program - CRITICAL THINKING & WRITING RUBRIC - ***Precis Form***
APPLIED TO: GEOL6340 - Tectonic Geomorphology, Spring 2015: Final Precis
10 students evaluated
Class total average: 8.3 out of 12, (4 is meeting PLO), class total standard deviation: 1.95

Student	Context & Purpose	Disciplinary Conventions	Syntax and Mechanics	Explanation of Issues	Total
1	2	2	1	1	6
2	1	2	0	1	4
3	2	2	2	2	8
4	3	2	2	3	10
5	3	2	2	2	9
6	2	2	3	3	10
7	2	3	3	2	10
8	2	2	2	2	8
9	2	3	2	2	9
10	2	3	2	2	9
Class average	**2.1**	**2.3**	**1.9**	**2.0**	**8.3**
Standard deviation	**0.57**	**0.48**	**0.88**	**0.67**	**1.95**

CSUEB Geology M.S. Program - ORAL COMMUNICATION VALUE RUBRIC – *Powerpoint Presentation Form*
APPLIED TO: GEOL6340 - Tectonic Geomorphology, Spring 2015: Class Presentation
10 students evaluated
Class total average: 10.6 out of 15, (5 is meeting PLO), class total standard deviation: 2.12

Student	Organization	Language	Delivery	Supporting Materials	Central Message	Total
1	2	3	2	2	3	12
2	1	1	1	2	1	6
3	2	2	3	2	3	12
4	1	2	2	2	2	9
5	2	2	3	2	2	11
6	2	2	2	2	2	10
7	2	3	3	3	2	13
8	2	3	3	2	2	12
9	2	2	1	2	2	9
10	3	2	2	3	2	12
Class average	**1.9**	**2.2**	**2.2**	**2.2**	**2.1**	**10.6**
Standard deviation	**0.57**	**0.63**	**0.79**	**0.42**	**0.57**	**2.12**

GEOL 6040 – Near Surface Geophysics – Fall 2014
Homework – Due Wed. Nov. 19th
Seismic Methods

Show your work

1. Consider a two-layer model with a horizontal interface. The velocity of the upper layer is 800 m/s and the velocity of the lower layer is 1600 m/s. The travel-time curve for the critically-refracted arrivals has a t-intercept of 35 ms. What is the depth of the interface?
2. Given a two-layer model with an upper layer 4 meters thick, where the velocity of the upper layer is 450 m/s and the velocity of the lower layer is 1600 m/s. What is the crossover distance?
3. Consider a horizontal layer 80 m thick with a velocity of 1800 m/s. A seismic survey is conducted using a source and receivers at the surface. Calculate the travel times for both a) the direct wave and b) the wave that is reflected at the base of the layer for source-receiver offsets of 0 m, 100 m, 200 m, and 400 m. Graph your computed values. For each of the two waves, draw the curve that passes through the points and label the wave type.
4. Consider the following two-layer model: Layer thicknesses are z_1 = 350 m and z_2 = 1600 m. Interval velocities are υ_1 = 1900 m/s and are υ_2 = 2800 m/s. a) Find the one-way travel time (interval transit time) for each of the layers. b) Find V_{RMS} for the first layer. c) Find V_{RMS} for the two-layer model.
5. The following RMS velocities and two-way travel times were measured from a CMP gather: $V_{RMS}1$ = 1450 m/s, $V_{RMS}2$ = 2280 m/s, $V_{RMS}3$ = 3300 m/s; t_1 = 0.580 s, t_2 = 0.640 s, t_3 = 1.210 s. Find the interval velocity and layer thickness of each of the three layers.
6. A marine survey is conducted using an four-channel receiver spread. The shot is located one receiver interval from the end of the spread on every shot. The shot and the reciever spread move together between shots. The shot interval is equal to the receiver interval. Sketch a stacking diagram, with the horizontal axis indicating receiver position and the vertical axis indicating source position. Lightly draw a few lines through receivers that belong to CMP gathers. What is the maximum number of traces per CMP gather (full fold) for this survey?

GEOL 6310 Isotope Geochemistry HOMEWORK 2 due Jan. 26

End of chapter problems from Faure and Mensing:

Ch. 4: 2, 4, 5

Ch. 5: 7 (can use Excel), 8, 9

Ch. 6: 1, 2 (Interpret the difference between the answers to 1 and 2)

Ch 7: 1

AND

Write an expository essay of about 1000 words that **compares and contrasts** the K-Ar and the $^{40}Ar/^{39}Ar$ methods. Include, for example, the type of samples that can be dated, which concentrations and isotopic ratios must be analyzed and the type of instrumentation required to measure each. Which method is in more frequent use in recent decades, and why? Also, briefly discuss practical considerations such as the amount of sample required, cost of analysis and time required for an analysis, and greatest possible precision of the final age.

Writing a Precis

As graduate students you are ideally expected to do many critical readings, to assess arguments, hypotheses or models, and then to present an informed argument of an article and to reproduce the logical development of the argument in as cogent a form as possible *in your own words*. In order to demonstrate that you have assimilated the central argument and proof of another scholar's critical interpretation, you must be able to compose a *precis* of an argument.

A summary or a precis is NOT a personal interpretation of a work or an expression of your opinion of the idea (you will never use the first-person I in a précis); it is, rather, *an exact replica in miniature of the work, often reduced to one-quarter to one-fifth of its size, in which you express the complete argument!*

What actually happens when you write a precis? First, *you must understand the complete work so that you can abstract the central argument and express it cogently and completely*. Next, you must develop the argument exactly as the writer has presented it AND reduce the work by 75-80% of its original size.

The key word here is *assimilation*. When you read the material, it is probable that you will understand only those parts that have associations within your own experience. Don’t get bogged down by mathematics if things are not initially clear: look at the terms and their arrangement – try to recognize fundamental relationships and try to verify them with your reading of the text.

How you actually go about writing a precis depends largely on your ability to restate the writer's central ideas after you have assimilated them in your own mind.

Steps to writing an effective précis:

1. Read the article many times most carefully.

2. Write a precis of the article in which you state the entire argument

and also to present the logical progression (the development) of the argument.

3. Reduce the article to around one-fifth to one-quarter of its original length

and omit nothing from the essential argument. This is, in reality,

the key to the whole enterprise!

4. Type the precis and begin with your abstraction of the central, inform-

ing idea of the article. Having understood and written the central idea,

present the essential argument(s) in as cogent manner as possible.

5. Here is a central rule: Do not copy a single sentence from the article! You may use

key words and phrases only when you are expressing ideas which are technically precise or when you feel comfortable using the writer's

own words, i.e., you understand exactly he or she means, and there

is really no better way to express the concept.

Finally, in order to complete this assignment, you will have to read the work most carefully, ask questions about the work repeatedly, and reach into your own geologic background so that you can best shape the writer's concepts!

These kinds of assignments are not easy! When you have completed it well, you will likely never forget the argument, the examples, and the development of the article. More than likely you will also be learning that, when you write research papers and other critical papers, you ability to write the precis is central to the basics of analysis, synthesis, comparison, and other key, higher order thinking skills absolutely required for your success in college and in the profession or career you have chosen when you graduate.

Department of Earth and Environmental Sciences, CSCI

CALIFORNIA STATE UNIVERSITY EAST BAY

ASSESSMENT PLAN: M.S. in Geology

Updated Winter 2015 by Jean Moran, Luther Strayer, and Mitchell Craig

PROGRAM MISSION

CSUEB Missions, Commitments, and ILOs, 2012 version

CSUEB Geology M.S. Program Description

To serve graduate students who are employed during the day, all graduate courses in the Department of Earth and Environmental Sciences are offered in the evenings and on weekends. In addition to regular catalog courses, recent graduate seminars and advanced topics courses have dealt with such subjects as sediment transport and modern depositional environments, rock mechanics, applied geophysics, isotope hydrology, tectonics and sedimentation. Additional facilities and part-time employment may be secured through Co-op programs, the Lawrence Berkeley and Lawrence Livermore National Laboratories, and the U.S. Geological Survey in Menlo Park. Candidates for this degree must be prepared to engage in significant individual research. Lately, student research in this department has included such topics as hydrogeology, near surface geophysics, areal geology and slope stability, geochemistry, structural geology, engineering geology, and neotectonics.

PROGRAM STUDENT LEARNING OUTCOMES (PLOs)

Students graduating with a M.S. in Geology will be able to:

PLO 1 *ILO 1,6*	Attain an advanced understanding of the relationship between geologic materials and their physical and chemical properties. *(Geologic Materials)*
PLO 2 *ILO 1,4,6*	Collect, analyze, and interpret data using advanced discipline-specific methods, techniques, and equipment. *(Data & Analysis)*
PLO 3 ILO 1,2,3,4,5,6	Critically analyze geological and environmental issues through the evaluation of current scientific literature, and present an argument clearly and persuasively in written and oral form. *(Communication)*
PLO 4 *ILO 1,2,4,6*	Conduct geologic research, including preparation of a project or thesis; the result should be of high enough quality to be presented at a professional meeting. *(Research)*
PLO 5 *ILO 1,3, 5,6*	Understand geologic time, evolution, Earth's place in the Universe, and global-scale processes such as plate tectonics, earth systems interactions, and climate change. *(Geologic Time)*

Year 1: 2013-2014	
1. Which PLO(s) to assess	PLO 3 *(Communication)*, PLO 4 *(Research)*
2. Assessment indicators	GEOL6320 Term Paper, GEOL6414 Precis & Oral Presentation, GEOL6910 Prospectus
3. Sample (courses/# of students)	GEOL6320/10, GEOL6414/15, GEOL6910/2.
4. Time (which quarter(s))	Fall 2013, Winter 2014, Spring 2014
5. Responsible person(s)	Luther Strayer, Jean Moran
6. Ways of reporting (how, to who)	The report was delivered to the Chair, and distributed to the faculty. It was also included within the department's annual program report.
7. Ways of closing the loop	Areas of improvement were discussed at faculty meetings, improvements and revisions to future courses are expected.

Year 2: 2014-2015	
1. Which PLO(s) to assess	PLO 1 *(Geologic Materials),* PLO 5 (*Geologic Time),*
2. Assessment indicators	Course assignments and projects, with department rubric.
3. Sample (courses/# of students)	GEOL6040/14, GEOL6310/10, GEOL6430/15
4. Time (which quarter(s))	Fall 2014, Winter 2015, Spring 2015.
5. Responsible person(s)	Mitchell Craig, Jean Moran, Luther Strayer.
6. Ways of reporting (how, to who)	Reports first to the Chair and then to the entire faculty for comment & discussion. An end-of-year meeting will be devoted to evaluating assessment results and "closing the loop."
7. Ways of closing the loop	Identified "areas for improvement" will be incorporated into modified/updated core courses for future majors

Year 3: 2015-2016	
1. Which PLO(s) to assess	PLO 2 *(Data & Analysis),* PLO 3 *(Communication)*
2. Assessment indicators	Course assignments and projects, precis & oral presentations of topical journal articles in the field, MS prospectus, MS project, MS thesis. Department rubrics will be used.
3. Sample (courses/# of students)	GEOL6320/15, GEOL6620/17, GEOL6811/12, GEOL6899/4, GEOL6910/2.
4. Time (which quarter(s))	Fall 2015, Winter 2016, Spring 2016.
5. Responsible person(s)	Luther Strayer, Jean Moran, department faculty.
6. Ways of reporting (how, to who)	Reports first to the Chair and then to the entire faculty for comment & discussion. An end-of-year meeting will be devoted to evaluating assessment results and "closing the loop."
7. Ways of closing the loop	Identified "areas for improvement" will be incorporated into modified/updated core courses for future majors. Issues with the Thesis process will be discussed and acted upon.

Year 4: 2016-2017	
1. Which PLO(s) to assess	PLO 4 *(Research),* PLO 5 *(Geologic Time).*
2. Assessment indicators	Course assignments and projects, precis & oral presentations of topical journal articles in the field, MS prospectus, MS project, MS Thesis. Department rubrics will be used.
3. Sample (courses/# of students)	GEOL6040/15, GEOL6414/15, GEOL6811/12, GEOL6899/5, GEOL6910/3.
4. Time (which quarter(s))	Fall 2016, Winter 2017, Spring 2017.
5. Responsible person(s)	Mitchell Craig, Luther Strayer, and affiliated faculty.
6. Ways of reporting (how, to who)	Reports first to the Chair and then to the entire faculty for comment & discussion. An end-of-year meeting will be devoted to evaluating assessment results and "closing the loop."
7. Ways of closing the loop	We will assess progress made since 2015-2016, adjust strategies. Revise program requirements concurrently with quarter-to-semester conversion.

Year 5: 2017-2018	
1. Which PLO(s) to assess	PLO 1 *(Geologic Materials)*, PLO 2 *(Data & Analysis)*
2. Assessment indicators	Course assignments and projects, precis & oral presentations of topical journal articles in the field, MS prospectus, MS project, MS Thesis. Department rubrics will be used.
3. Sample (courses/# of students)	GEOL6020/15, GEOL6414/15, GEOL6899/6, GEOL6910/3.
4. Time (which quarter(s))	Fall 2017, Winter 2018, Spring 2018.
5. Responsible person(s)	Luther Strayer, Jean Moran, Mitchell Craig.
6. Ways of reporting (how, to who)	Reports first to the Chair and then to the entire faculty for comment & discussion. An end-of-year meeting will be devoted to evaluating assessment results and "closing the loop."
7. Ways of closing the loop	Assess progress made since 2016-2017, adjust strategies.