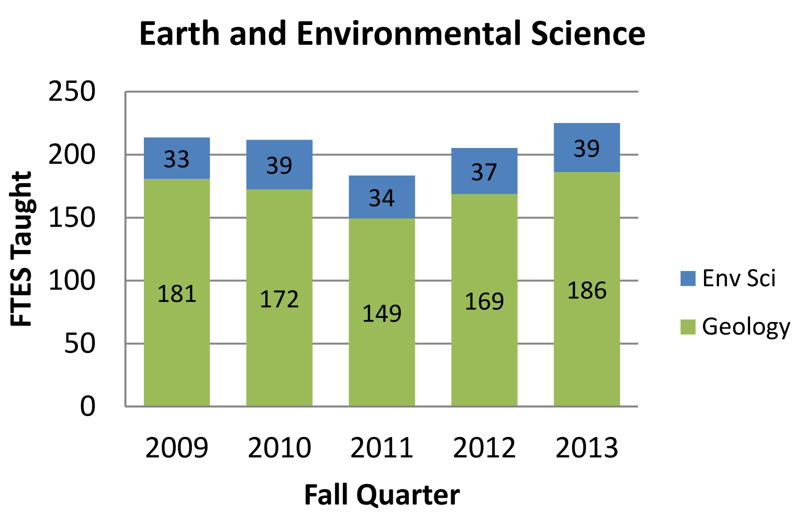
Geology BS and BA Program Annual Report 2013-14

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 undergraduate (BS and BA) programs.

Enrollment

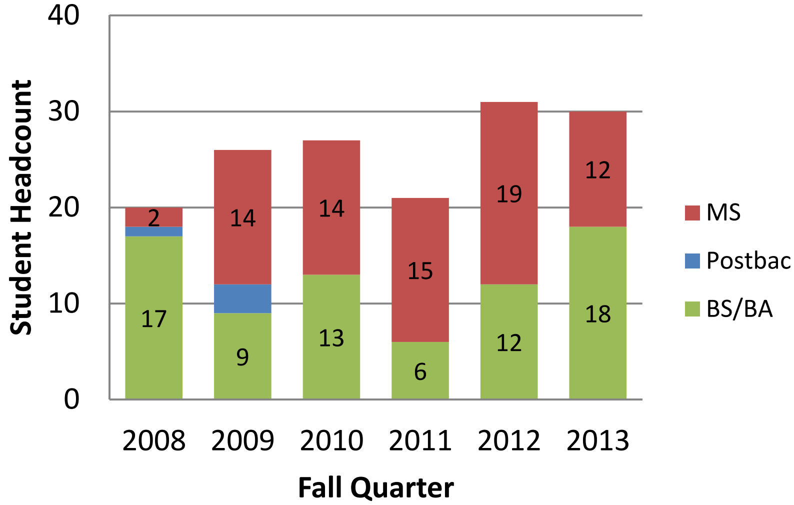
Enrollment in courses offered by the department as measured by Fall Quarter FTES has increased during the past two years and is currently 225 (see figure below), the majority from Geology courses. A large portion of the department's enrollment is due to its participation in the General Education (GE) Program. This includes Freshman Learning Communities (clusters) and upper-division GE. The department taught in four GE clusters during AY 2013-14. We 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 undergraduate (BS and BA) Geology programs has steadily increased during the past two years, and is currently 18.



Number of majors in Geology programs, 2008-2013.

Student Advising

Student advising for the Geology B.A. and B.S. programs is provided primarily by department faculty or the department chair. We created roadmaps for student advisement, which are provided below.

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 M.S. degree, and seven have a Ph.D. in Geology or a related field.

Staff

The department 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.

Assessment

The department developed and implemented new assessment materials for the Geology BS and BA programs during 2013-14. The revised materials and assessment results for 2013-14 are provided below.

California State University, East Bay

APR Summary Data

Fall 2008 - 2013

Dept. of Earth and Environmental Sciences						
	Fall Quarter					
A. Student Headcount	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
1. Undergraduate	43	45	43	40	48	66
2. Postbaccalaureate	2	5	1	0	0	0
3. Graduate	2	14	14	15	19	12
4. Total Number of Majors	47	64	58	55	67	78
	College Years					
B. Degrees Awarded	**07-08**	**08-09**	**09-10**	**10-11**	**11-12**	**12-13**
1. Undergraduate	3	14	9	6	7	5
2. Graduate	0	0	1	0	2	5
3. Total	3	14	10	6	9	10
	Fall Quarter					
C. Faculty	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Tenured/Track Headcount						
1. Full-Time	4	4	4	4	4	5
2. Part-Time	0	0	0	0	0	0
3a. Total Tenure Track	4	4	4	4	4	5
3b. % Tenure Track	40.0%	40.0%	30.8%	33.3%	30.8%	35.7%
Lecturer Headcount						
4. Full-Time	0	0	0	0	0	0
5. Part-Time	6	6	9	8	9	9
6a. Total Non-Tenure Track	6	6	9	8	9	9
6b. % Non-Tenure Track	60.0%	60.0%	69.2%	66.7%	69.2%	64.3%
7. Grand Total All Faculty	10	10	13	12	13	14
Instructional FTE Faculty (FTEF)						
8. Tenured/Track FTEF	2.2	0.92	3.61	3.33	3.28	4.58
9. Lecturer FTEF	2.48	4.6	3.33	3.73	3.87	4.27
10. Total Instructional FTEF	4.69	5.51	6.94	7.07	7.15	8.85
Lecturer Teaching						
11a. FTES Taught by Tenure/Track	66.5	22.5	63.7	65.2	63.4	68.2
11b. % of FTES Taught by Tenure/Track	48.4%	10.5%	30.1%	35.5%	30.9%	30.3%
12a. FTES Taught by Lecturer	70.9	191.1	148.2	118.3	141.9	156.9
12b. % of FTES Taught by Lecturer	51.6%	89.5%	69.9%	64.5%	69.1%	69.7%
13. Total FTES taught	137.3	213.7	211.9	183.5	205.3	225.1
14. Total SCU taught	2060.0	3205.0	3178.0	2752.0	3079.0	3377.0

D. Student Faculty Ratios	2008	2009	2010	2011	2012	2013
1. Tenured/Track	30.2	24.6	17.6	19.6	19.4	14.9
2. Lecturer	28.5	41.6	44.5	31.7	36.7	36.8
3. SFR By Level (All Faculty)	29.3	38.8	30.5	26.0	28.7	25.4
4. Lower Division	44.3	44.5	41.9	30.9	35.2	24.7
5. Upper Division	15.3	34.0	27.9	25.3	34.8	29.7
6. Graduate	11.0	17.5	4.2	5.6	4.9	6.1

E. Section Size	2008	2009	2010	2011	2012	2013
1. Number of Sections Offered	27.0	26.0	27.0	31.0	32.0	35.0
2. Average Section Size	23.9	35.5	36.2	30.1	34.9	32.1
3. Average Section Size for LD	29.6	40.5	46.1	34.3	36.1	33.3
4. Average Section Size for UD	15.8	30.8	29.9	26.4	35.3	34.2
5. Average Section Size for GD	11.0	17.0	12.0	14.0	14.0	10.0
6. LD Section taught by Tenured/Track	10	1	8	8	9	9
7. UD Section taught by Tenured/Track	4	3	3	2	0	7
8. GD Section taught by Tenured/Track	0	1	2	4	7	4
8a. N sections taught by TT	14	5	13	14	16	20
9. LD Section taught by Lecturer	6	12	4	8	6	9
10. UD Section taught by Lecturer	5	8	8	7	9	8
11. GD Section taught by Lecturer	2	1	2	2	1	0
11a. N sections taught by Lecturers	13	21	14	17	16	17
12. % of Sections taught by TT (#8a / #1)	48.1%	80.8%	51.9%	54.8%	50.0%	48.6%

Source and definitions available at: http://www.csueastbay.edu/ira/apr/summary/definitions.pdf

	Fall Quarter					
Headcount Enrollment	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Environmental Science						
1. Undergraduate	26	36	30	34	36	48
2. Postbaccalaureate	1	2	1	0	0	0
3. Graduate	0	0	0	0	0	0
4. Total Number of Majors	27	38	31	34	36	48
Geology						
1. Undergraduate	17	9	13	6	12	18
2. Postbaccalaureate	1	3	0	0	0	0
3. Graduate	2	14	14	15	19	12
4. Total Number of Majors	20	26	27	21	31	30

Degrees Awarded	College Years					
	07-08	08-09	09-10	10-11	11-12	12-13
Environmantal Science						
1. Undergraduate	1	5	6	3	4	4
2. Graduate	0	0	0	0	0	0
3. Total Number of Majors	1	5	6	3	4	4
Geology						
1. Undergraduate	2	9	3	3	3	1
2. Graduate	0	0	1	0	2	5
3. Total Number of Majors	2	9	4	3	5	6

	2008	2009	2010	2011	2012	2013
D. Student Faculty Ratios	Environmental Science					
1. Tenured/Track	.	.	.	.	.	8.1
2. Lecturer	89.2	61.7	73.9	36.5	45.6	86.9
3. SFR By Level (All Faculty)	89.2	61.7	73.9	36.5	45.6	17.7
4. Lower Division	89.2	61.7	73.9	36.5	45.6	18.4
5. Upper Division	.	.	.	.	.	13.0
6. Graduate	.	.	.	.	.	0.0
E. Section Size						
1. Number of Sections Offered	1.0	2.0	2.0	4.0	3.0	6.3
2. SCU taught	356.0	492.0	592.0	511.0	548.0	585.0
FTES (=SCU/15)	23.7	32.8	39.5	34.1	36.5	39.0
3. Average Section Size	89.0	61.5	74.0	33.3	45.7	27.6
4. Average Section Size for LD	89.0	61.5	74.0	33.3	45.7	27.6
5. Average Section Size for UD	0.0	0.0	0.0	0.0	0.0	0.0
6. Average Section Size for GD	0.0	0.0	0.0	0.0	0.0	0.0
7. LD Section taught by Tenured/Track	0	0	0	0	0	4
8. UD Section taught by Tenured/Track	0	0	0	0	0	2
9. GD Section taught by Tenured/Track	0	0	0	0	0	0
10. LD Section taught by Lecturer	1	2	2	4	3	1
11. UD Section taught by Lecturer	0	0	0	0	0	0
12. GD Section taught by Lecturer	0	0	0	0	0	0
D. Student Faculty Ratios	Geology					
1. Tenured/Track	30.2	24.6	17.6	19.6	19.4	19.8
2. Lecturer	21.3	39.0	38.9	30.1	34.3	33.4
3. SFR By Level (All Faculty)	25.7	36.3	26.9	24.4	26.6	28.0
4. Lower Division	38.4	40.7	34.8	29.1	32.1	28.4
5. Upper Division	15.3	34.0	27.9	25.3	34.8	31.5
6. Graduate	11.0	17.5	4.2	5.6	4.9	6.1
E. Section Size						
1. Number of Sections Offered	26.0	24.0	25.0	27.0	29.0	28.8
2. SCU taught	1704.0	2713.0	2586.0	2241.0	2531.0	2792.0
FTES (=SCU/15)	113.6	180.9	172.4	149.4	168.7	186.1
3. Average Section Size	21.3	33.1	33.0	29.6	33.5	33.0
4. Average Section Size for LD	25.7	36.6	40.5	34.6	33.7	35.5
5. Average Section Size for UD	15.8	30.8	29.9	26.4	35.3	34.2
6. Average Section Size for GD	11.0	17.0	12.0	14.0	14.0	10.0
7. LD Section taught by Tenured/Track	10	1	8	8	9	5
8. UD Section taught by Tenured/Track	4	3	3	2	0	5
9. GD Section taught by Tenured/Track	0	1	2	4	7	4
10. LD Section taught by Lecturer	5	10	2	4	3	8
11. UD Section taught by Lecturer	5	8	8	7	9	8
12. GD Section taught by Lecturer	2	1	2	2	1	0

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

ASSESSMENT PLAN 2013-14

GEOLOGY B.S., B.A.

25 August 2014

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

Assessment Plan 2013-14
Geology B.S., B.A.

Contents

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

Program Learning Outcomes
Geology B.S., B.A.

Students graduating with a B.S or B.A. in Geology from Cal State East Bay will be able to:

1. identify and classify geologic materials, including minerals, rocks, and fossils, and know their material and/or biological properties or characteristics. (Geologic Materials)

2. collect, organize, and analyze qualitative and quantitative data from both field and laboratory investigations such as lithostratigraphic and biostratigraphic correlations, geologic maps, geophysical surveys, cross-sections, soil tests, and geochemical and groundwater quality analyses. (Data Analysis)

3. synthesize, interpret and critically analyze geologic datasets (2D and 3D) and reports using discipline-specific methods, techniques, and equipment. (Interpretation)

4. critically analyze geological and environmental issues through the evaluation of scientific literature, and present their positions clearly and persuasively in written and oral form. (Communication)

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

ILO Alignment Matrix for Geology B.S., B.A. Programs

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

	BSBA PLO 1 Geologic Materials	BSBA PLO 2 Data Analysis	BSBA PLO 3 Interpretation	BSBA PLO 4 Communication	BSBA 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	
ILO 5: Sustainability				X	X
ILO 6: Specialized Education	X	X	X	X	X

*diversity in the natural world, including evolutionary diversity, and ranging from microscopic to astronomic scales.

CSU East Bay, Dept. of Earth & Environmental Sciences

Degree: B.S. and B.A. in Geology

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

				Program Learning Outcomes				
Assess	**Course**	**Title**	**Option**	**1. Geologic Materials**	**2. Data Analysis**	**3. Interpretation**	**4. Communi-cation**	**5. Geol. Time**
*	GEOL	2101	Physical Geology	I*	I*	I*	I	I
*	GEOL	2102	Earth and Life Through Time	I*	P*	I		P*
	GEOL	2600	Introduction to GIS		I	P		P
	GEOL	3110	Principles of Geomorphology		P	P		I
	GEOL	3400	General Oceanography	P	P			I
	GEOL	3500	Environmental Hydrology		M	P	P	
*	GEOL	3601	Mineralogy and Optical Crystallography	P*		P	P*	P
*	GEOL	3701	Igneous and Metamorphic Petrology	P*	P	P	P*	P
*	GEOL	3801	Sedimentology and Stratigraphy	P	P*	P*	I	I*
*	GEOL	3810	Structural Geology	P	P*	I*	P*	P*
*	GEOL	3910	Geologic Field Methods	P	P*	M*		M
	GEOL	3999	Issues in Geological Sciences			P	P	M
*	GEOL	4010	Applied Geophysics		P*	P*		
	GEOL	4130	Survey of Geochemistry	P	P	I	P	M
	GEOL	4140	Hazardous Waste Management		P	P	M	I
	GEOL	4200	Introduction to Planetary Science	P	P	I	P	M
	GEOL	4320	Hydrogeology	P	M	P	P	
	GEOL	4414	Earthquake Geology	P		P	M	M
	GEOL	4600	GIS for Earth Sciences		M	M		P
*	GEOL	4800	Seminar				M*	

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

*	This course used to assess program learning outcomes
(green)	This course used for 2013-2014 assessment

CSUEB Geology B.S., B.A. Program - CRITICAL THINKING VALUE RUBRIC

Creative thinking is both the capacity to combine or synthesize existing ideas, images, or expertise in original ways and the experience of thinking, reacting, and working in an imaginative way characterized by a high degree of innovation, divergent thinking, and risk taking.

This rubric may be applied to student **writing assignments** and **projects** in order to assess how well the Geology B.S., B.A. Program Learning Outcomes have been achieved.

	Exemplary 3	**Accomplished** 2	**Competent** 1	**Insufficient Evidence** 0
1. **Competencies** *Strategies and skills that apply to geological problem solving (i.e. discipline-specific lab & field exercises).*	**Clearly understands purpose** and role of the exercise and its importance and context within the Earth Sciences and/or related subfield. Proposes/develops **new means methods** to address the problem.	**Strong understanding of purpose** and role of the exercise and its importance and context within the Earth Sciences and/or related subfield. Uses discipline-appropriate means to address the problem.	**Understanding** of the purpose and role of the exercise and **some insight** into its importance and context within the Earth Sciences and/or related subfield. **Follows** instructions and **understands** the steps.	**Poor understanding** of the purpose and role of the exercise with **little/no insight** into its importance and context within the Earth Sciences and/or related subfield. Unable to follow instructions.
2. **Problem Solving**	Develops a **logical, consistent plan** to solve problem, and **recognizes consequences** of solution and **can articulate** reason for choosing solution.	Develops a **plan** to solve the problem. Has some **insight into consequences** and **some ability to articulate** reason for choosing solution.	**Considers and rejects less acceptable approaches** to solving problem.	Only a **single approach** is considered and used to solve the problem.
3. **Embracing Contradictions**	**Integrates** alternate, divergent, or contradictory perspectives or ideas **fully**. **Proposes/uses** multiple working hypotheses.	**Incorporates** alternate, divergent, or contradictory perspectives or ideas in a **exploratory** way. **Applies** multiple working hypotheses	**Includes** (**recognizes** value) alternate, divergent, or contradictory perspectives or ideas in a limited way. Has **difficulty** creating multiple working hypotheses	**Fails to Acknowledge** alternate, divergent, or contradictory perspectives or ideas. **No use** of multiple working hypotheses
4. **Innovative Thinking**	**Creates** a novel/unique idea, method, hypothesis, format, or product.	**Imagines/conceives** a novel/unique idea, method, hypothesis, format, or product.	**Reformulates** a collection of available ideas.	**No new ideas**
5. **Connections, Synthesis, Transformation**	**Synthesizes** ideas or solutions into a **coherent whole**.	**Connects** ideas or solutions in novel ways.	**Recognizes** existing connections among ideas or solutions.	**No recognition** of significance of exercise to discipline or global context.

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

CSUEB Geology B.S., B.A. Program – 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 B.S., B.A. 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

Assessment Results, 2013-2014

Overview

We present four assessments from the B.A and B.S. Program in Geology that evaluate a full range of Program Learning Outcomes. Not surprisingly, all of the assessments presented here are derived from laboratory-based assignments. Capstone and other milestone experiences in geology typically and necessarily integrate the traditional 'lecture hall' experiences of reading, critical analysis, and subsequent written communication (our PLOs 2 & 3), but also the very applied experience of working with geologic materials, maps and techniques in the laboratory and the field. As such, the *Laboratory Skills / Course Project* rubric is applied in all cases.

These four assessments analyze 30 separate pieces of student work derived from four sequential courses that progress in complexity.

In the two 'lower-level' classes (GEOL 3701 and 3801) overall class results are strong and there are no students that fall below the minimum competence level. In fact results indicate that our students are operating at or above the 'accomplished' level.

The two 'upper-level' classes (GEOL 3810 and 3910) are difficult courses, where students are introduced to the complications of three-dimensional geometry and thinking. These difficult-to-grasp concepts are applied in both the laboratory and in the field. Here we see the both the rigor of the courses and difficulty that some students have with 3D thinking, spatial relationships, their comfort working in the field, and applying mathematical analysis to natural systems. In these courses there are four instances where students perform below the level of basic competence, and two instances of work that is at, or just above, minimum competence level. The large standard deviation for the Field Methods (GEOL3910) is evidence of this.

Course assessments are briefly summarized below. Assessments were performed using the departmental rubrics, modified as needed to take into account the requirements of the assignment.

GEOL 3710 – Igneous and Metamorphic Petrology: Term Project

Term-long comprehensive study of a suite of rocks. A course average of 10.7/15, where 5/15 indicates "competence" and 10/15 indicates "accomplishment". The large standard deviation (2.66) indicates that there is a wide range of abilities. The lowest average scores in the area of 'Organization' is consistent with difficulties students encounter when needing to track numerous aspects of the project and integrate them into a coherent piece of work.

This project provides an excellent introduction to the methods used by and skills required of a professional geologist. It incorporates all of the Geology BS/BA PLOs, and the students highly value the experience.

GEOL 3801 – Sedimentology and Stratigraphy: Cull Canyon Stratigraphic Section

Field data collection, laboratory analysis and discipline-specific write-up. Course average is 9.8/12 , where 4/12 indicates competence and 9/12 indicates accomplishment. The lowest scores indicate that execution is a weak area relative to others. Future efforts to demonstrate methods, provide examples and make clear the expectations for the final product may help in this area, but overall the class results are very strong.

We would be wise to continue and ideally increase the number of field experiences in order to produce students with strong field skills. There is no substitute for field experience and no question that the more time in the field that students accumulate, the more insight they will have in other aspects of geology.

GEOL 3810 – Structural Geology: Term Project

A term-long, semi-cumulative analysis of a complexly deformed area in Montana. Course average is 8.6/15, where 5/15 is ‘competent’ and 10/15 is ‘accomplished’. With the exception of one student who barely met the competence threshold (5/12), the results are solid.

These types of term-long, highly integrative projects that simulate professional duties are an important part of a modern education in geology. The difficult nature of this type of assignment is visible in the low scores in the areas of "Quantitative Skills and Synthesis". This is not surprising considering that many students have poor math and critical analysis skills. Both of these are likely issues prior to attending CSUEB, and thus it is incumbent upon us to maintain and even increase the number of assignments that require our students to apply mathematical methods to geologic problems, and to read challenging scientific literature for content and analysis.

GEOL 3910 – Geologic Field Methods: Geologic Map

Produce from direct field investigation a geologic map and report. Course average is 8/15, where 5/15 is ‘competent’ and 10/15 is ‘accomplished’. Two students failed to meet the competence threshold (5/12), and one was just above it (6/12). There is a relatively large range of scores, as indicated by the standard deviation of 4.65.

This serves as a capstone course and may be, in many ways, the most difficult course for many students: it is a field class, where ideally all of the methods from previous courses are applied. Issues range from discomfort from being in the field, difficulty recognizing rock types and structures, and inability to visualize in 3D. This assessment area does not necessarily measure how good a geologist a student may be, but rather reflects more on their ability to operate comfortably in a field environment (hills, wildlife, 3D, etc.), which is not necessary for all geologists, as some may prefer to work in laboratory or less rugged field environments.

CSUEB Geology B.S., B.A. Program Assessment

Rubric: **Lab Project**

Course: GEOL-3801: Sedimentology and Stratigraphy

Quarter: Spring 2014

Assignment: Cull Canyon Stratigraphic Column

Student ID	Organization	Presentation	Execution	Connection, Synthesis, Transformation	Total
1	3	3	2	3	11
2	2	2	2	2	8
3	3	3	2	3	11
4	2	2	2	2	8
5	3	3	2	3	11

Notes: Quantitative skills are not assessed by this project; they are assessed using other lab assignments in the course

CSUEB Geology B.S. Program - LAB SKILL COURSE PROJECT RUBRIC
APPLIED TO: GEOL3810 Winter 2014

GEOL3810 Quarter Lab Project: BS_PLO's 2 & 4 Class Average = 8.6

Student	Organization	Presentation	Quantitative Skills	Execution	Connection/ Synthesis/ Transform	Total
pr3277	2	2	2	2	2	8
wg2728	3	2	2	3	2	10
yg6466	3	3	2	3	2	11
mw6564	2	3	2	3	2	10
qm4554	2	2	2	3	3	9
xv2896	2	1	1	1	1	5
in2972	2	1	2	2	2	7
tj2344	3	3	2	3	2	11
fn2395	2	1	2	1	1	6
fp3887	2	2	2	2	1	8
sw4285	3	2	2	3	3	10
sp2953	2	2	2	2	2	8

CSUEB Geology B.S., B.A. Program Assessment

Rubric: **Lab Project**
Course: GEOL 3910
Quarter: Spring 2014
Assignment: Geologic Map

Student ID	Organization	Presentation	Quantitative Skills	Execution	Connection, Synthesis, Transformation	Total
1	1	0	2	0	1	4
2	1	1	2	1	1	6
3	1	0	1	1	1	4
4	3	2	2	3	3	13
5	3	3	3	3	3	15
6	3	2	2	2	1	10
7	1	0	1	1	1	4

GEOL 3701 Igneous and Metamorphic Petrology
Instructions and Guidelines for Rock Suite Project

SYNOPSIS: You will carry out a petrological research project for the rock suite of your choice from our outstanding collection. Then, similar to Mineralogy class last quarter, you will create and submit a manuscript suitable for publication in a petrological journal. However, this quarter, your manuscript will be based upon your *own* research, data collection, observations, discussion-synthesis, and conclusions. The rock suite project will be worth 20% of your overall course grade; do not take the project lightly! I recommend that you begin early in the quarter, as significant out-of-class lab time will be required.

TOPIC:

Choose a rock suite from our extensive collection. I suggest that you first look at the rock suites to learn which are available, then do some research on localities of interest before making your choice. I can help you decide if you want, just ask!

RESEARCH:

Your paper should include the general geology of your samples (geologic setting, location, previous work by others, etc.). The bulk of research, however, will be complete hand sample and thin section descriptions, following the same procedures as used in the class lab exercises. Collect data systematically - prepare tables and figures as appropriate. Labeled photographs, photomicrographs, and sketches are an excellent way to convey information. When you have completed the research, integrate what you observe about your samples with the bigger regional geologic picture. This is the quantum leap - you must synthesize your observations to come up with a petrogenesis for your rock suite that is supported by your observations. This requires a lot of thought.

MANUSCRIPT FORMAT:

Following examples from the journal Geochemica, Cosmochemica Acta (posted on Blackboard).

Organize your paper as follows:

Title

Abstract: 200 to 300 words; what did **you** do, how did **you** do it, what did **you** find out

Introduction – Geologic History – Setting etc. (you will have to research this…)

Methods – how did you carry out your study of your rock suite samples

Results – your hand sample and thin section descriptions, etc. (can be an Appendix…)

Discussion – how do your hand sample results fit into the context of the geologic setting and characteristics of your field area? Synthesize your results into a story…

Conclusions – what did you find?

Reference List

GUIDELINES:

In your paper you are expected to reference your sources -- class readings, any published source (books or articles) or the Internet (however, as the quality of materials on the Internet can vary drastically, you should use some discretion here). For a paper of this size, 10 cited references is a good average. YOUR PAPER MUST BE YOUR OWN WORK. Do not lift sentences directly from a text; this is plagiarism and is subject to academic punishment. Your must express the ideas and concepts in your own words. But you MUST cite/reference the source of your information -- give credit where credit is due. If you do not cite the source of your information, this is also plagiarism. Feel free to use illustrations – plots – diagrams, etc. (remember a picture says a thousand words…), just be sure to include Figure Numbers, Figure Captions, and Figure References.

Do not use quotes unless it is necessary to illustrate your point or you are critiquing someone else. For this paper, you should be able to express your ideas in your own words. Do not use terms or jargon that you are not familiar with. If I do not understand what you are writing about, I will come to you and ask and you must be able to explain what you mean.

Remember that petrology is a science concerned with phenomena at a wide variety of scales - from mappable units, to hand samples, to microscopic examination. Your paper should reflect this breadth of scale. Your paper should include a map of the geology and sample locations if available.

I will help you every step of the way - research, petrography, paper organization, etc. Just ask! **The best way to get my help is to turn in a draft!!**

REQUIREMENTS:

Length: 7-8 pages of double-spaced text (excluding title page, abstract, references, tables and figures).

1 inch margins all around with 12 pt font.

Follow the format for the journal Geochimica et Cosmochimica Acta for style (references, figure captions, organization, etc.). The instructions for contributors are found in each January issue of that journal (copy on our bookshelf; also scanned and posted on Blackboard).

DUE DATES:

Rock Suite Selection Deadline: see syllabus

Manuscript first draft deadline: see syllabus. This deadline is optional. You may turn in your paper on this date and I will grade it. If you are satisfied with your paper and grade, you have completed the assignment. If you are dissatisfied with your grade, you may edit/rewrite your paper and turn it in at the final deadline for a revised final grade.

Manuscript final version deadline: see syllabus. This deadline is mandatory. If you did not submit a first draft at the first deadline, you must submit a manuscript on or before this date.

NAME___________________ROCK SUITE____________________YEAR__________

(100 Points Possible)

(5) **Title**

(15) **Abstract**

(10) **Introduction and Geologic Setting**

(5) **Methods**

(15) **Hand sample descriptions and observations**

(15) **Thin section descriptions and observations**

(15) **Discussion (Synthesis)**

(15) **Conclusions**

(5) **References: usage and list**

Overall

Cull Canyon Outcrop Exercise
Geology 3801
Spring 2014

Purpose: The following pages contain suggestions concerning how and what you should observe in the field, what to record and how to record it. In addition this exercise will acquaint you with some standard techniques for creating a stratigraphic section, collection of samples, and utilizing data gathered in the field.

Method: You will measure and describe the stratigraphic section of an exposure in Cull Canyon. A brief report, including graphic presentation of the section will be prepared. You will work in concert with a partner(s).

THE STRATIGRAPHIC SECTION

Measuring Section

In areas where the geology is not known, measuring and describing the stratigraphic section is one of the most important initial steps of a geological investigation. The obvious purpose behind measuring section is to familiarize the geologist with the local stratigraphy. Measuring a section also aids the geologist in recognizing structural complexities (duplication or omission of strata), interpreting the region's tectonic history, and recognizing stratigraphic similarities (as well as differences) in other locales. The purpose behind having you measure section is two-fold. Number one, it is intended to familiarize you with the local stratigraphy, so that you can learn to recognize a formation or unit based on its lithologic character. Number two, while measuring the section, you are to observe and record specific information concerning the lithologic content of all units. Doing so will aid you in the interpretation of the region's geologic history.

Lithologic Field Descriptions

1. Before commencing measurement, examine the section and decide on the subdivisions that are to be described. Normally, each measured unit will constitute a homogeneous bed (or group of beds) which has (have) uniform composition, texture, structure, and fabric.

2. Describe each unit in detail. Assigning rock names is to be done in accordance with the classification scheme of McBride which is appended on a later page in this handout. Individual, distinct rock types should be treated separately. Where units are thin, repetitive (either rhythmic or cyclic) and of similar rock type, it is appropriate and simplest to treat these units as one interbedded unit (e.g., see sample description below). You may find it more practical to take samples back to the lab in order to determine some of these descriptive features. If you bring samples back to the lab make sure you mark/note where they were collected and make sure the samples are labeled.

An example description is given below. For each lithologic unit, you are to determine, record and present (in your stratigraphic column), each of the following lithologic features, and in the following order:

1. Rock name
2. Mineralogy
3. Fresh color
4. Weathered color
5. Dominant grain size
6. Degree of sorting
7. Degree of rounding
8. Degree of induration (see below)
9. Bedding thickness (see below)
10. Bedding shape (planar parallel, wedge, lens)
11. Type of cement
12. Fossil content (non-, moderately-, or richly fossiliferous; identify major phyla)
13. Sedimentary structures
14. Basal contact relationships (gradational, sharp, erosive, unconformable)
15. Weatherability (slope-forming (erodable), cliff-forming (resistant))
16. Other pertinent features

Example

0-.3m Limestone, (Calcite and minimal if any Dolomite), Light-gray organized into medium thickness beds consisting of rippled, coarse, well-sorted, well-rounded/abraded grains (dominantly skeletal fragments) at bottom, and thickly laminated mud at the top (Mud approx. 50%, Coarse sand approx. 30%, and gradational mix of the two approx. 20%, fossils include fragments of brachiopods, echinoderms, bivalves, and other unrecognizable skeletal fragments, a few distinguishable Archimedes, Fenestrellina, and Rhynchotreta.

.3-.8m Sandstone (quartz (40%), feldspar (30%), rock fragments (10%) clay (10%, calcite cement (10%)), Reddish-orange, Medium-sand: poorly sorted, sub-angular grains, Medium-bedded, Cross-bedded, ripple marks and tool marks on bedding surfaces, Fossils consist of Atroya, assorted shell fragments, several individual vertical burrows (including Skolithos), and a few undefinable plant fragments.

Be sure to include the nature of unit contacts and any paleocurrent indicators in your description.

Do not omit items, e.g., if there are no fossils, don't ignore it, call it non-fossiliferous.

Constructing the Stratigraphic Column

Graph paper will be provided upon which you can record your field observations as shown in the example (Figure 2.1), using the appropriate symbols (Figure 2.2). The final drafted stratigraphic section must exactly follow the format shown in figure 2.3, and include a detailed lithologic description (discussed above)

Report: The laboratory report will be in three parts.

1. Description of the measured section. Uppermost unit will be at top of the page, and lowermost unit at bottom of written description.

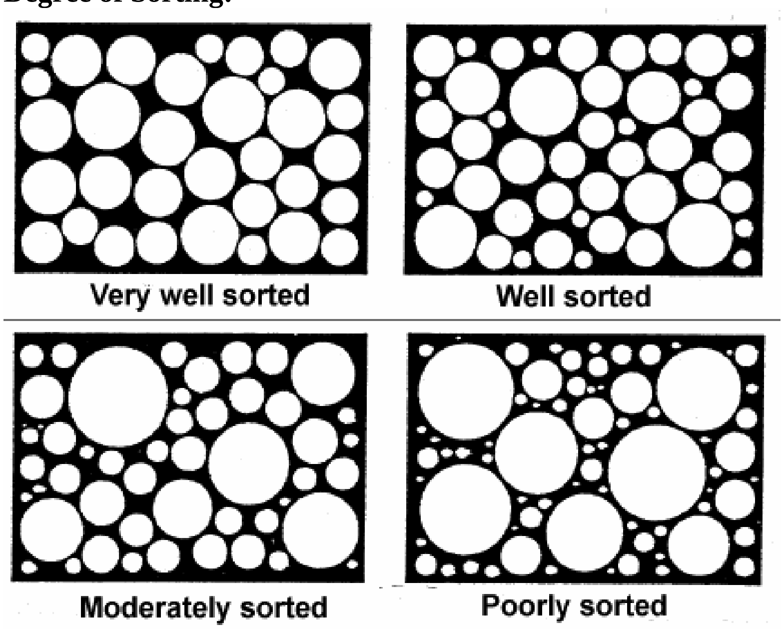
2. Graphic section which is a carefully prepared drawing that depicts basic features of the section to scale. See attached example. Section should include a scale, a title, and a legend, explaining symbols used in the graphic section.

3. lnterpretation of depositional environments. This will begin with a statement of the evidence and will be followed by environmental interpretation. Vertical changes in lithology, structure, texture, etc. reflect changes of environment. Be certain that your interpretation accounts for such changes.

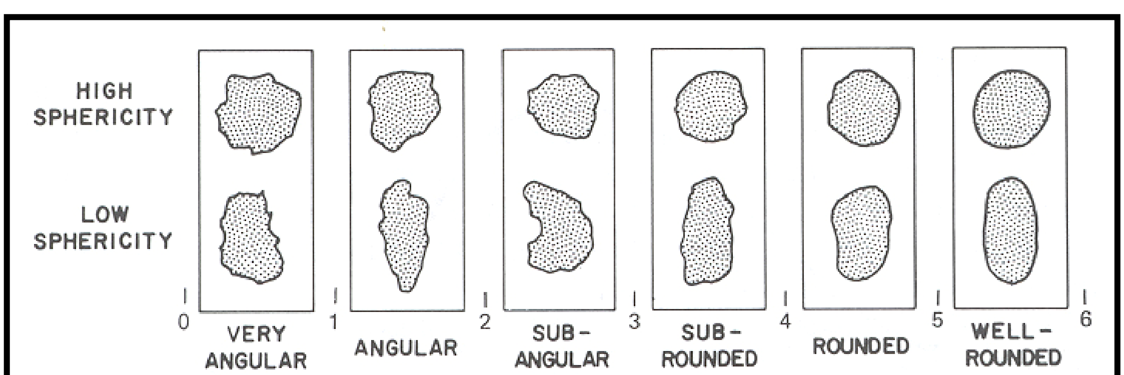
Use the following charts and diagrams for their respective features:
Bedding

thinly laminated = less than 3 mm
thickly laminated = 3 mm to 1 cm
very thin-bedded = 1 cm to 3 cm
thin-bedded = 3 cm to 10 cm
medium-bedded = 10 cm to 30 cm
thick-bedded = 30 cm to 1 m
very thick-bedded = 1-2 m
massive = >2m

Degree of Sorting:



Rounding:



Attached [B]

GEOL3810 Montana Map Project Winter 2014

Small Hand-Draw Structure Section

For your assigned map area, choose any 6-inch long segment of any of the cross-sections on you map (labeled A-A' & B-B', etc.) to:

1) Create a topographic profile of your chosen section, labeled after your map section in, i.e. a subsection of line A-A' will be labeled a-a'.
- confirm your section choice with Strayer before beginning.
- you will be supplied a cross-section template (and online) on which you will construct your topographic profile.
- When the profile is perfect (check with Strayer), then make multiple copies. You will construct your Structure Sections on these.

2) Create a geologic cross-section that takes into account the contacts, faults and structure data that are within 2000 feet (1 inch) on either side of the cross-section.
- project data perpendicularly to the section line.
- make apparent dip corrections (use hand stereonet) for structure-section dips.

3) Using stereonet software, plot the S/D of bedding and fault dips (planes & poles for bedding; planes for faults – mark the faults, in 2 plots). Make a □-diagram and interpret it.

Turn In (with your final Montana Map Project):
A) Completed colored & inked Structure Section;
B) Stereonets of bedding and faults, with faults plotted with bedding, and an interpreted □ -diagram of poles to bedding (3 total), and;
C) Brief, <1 page summary interpretation of the structure section and stereonets.

GEOL3810 Structural Geology **Winter 2014**

Montana Map & 3D Model Project

Turn-In (in binder/folder, etc. format, appropriately labeled with separate sections A-C) - below):

A) Major Faults Three-Point Problems & Stereonets

- All materials (see [A] attached)

B) Small-Scale Structure Section

- All materials (see [B] attached)

C) Three-Dimensional Model of a Quadrangle in the Montana Disturbed (Thrust) Belt

(1a) Completed model in Move '.mve' format with the following filename format (for example *Strayer_SR.mve* for a Sawtooth Ridge model) that includes the map surface and at least 2 constructed cross-sections and appropriate faults within the map violume.

(1b) Submit it to the class Wiki in a space created under your ***last name***

(2a) Stereonet Analysis of the major folding in your area. Produce at least 1 b- or p-diagram for each important fold system in your area (min2, max 5. CHECK WITH ME IF ANY QUESTIONS ON WHAT CONSTITUTES A FOLD OR SYSTEM PLEASE.

(2a) One paragraph description of fold/folding per stereonet and;

(2b) One paragraph on how they (the folds) are related to the local deformation there.

(3a) Brief description (1 page 1.5 spaced) of the stratigraphy in the map area, and relate the lithology to possible sedimentary environments of deformation. Ponder… which of these (if any) were being deposited syn-tectonically, and what was that environment?

(4b) Brief description (1-2page 1.5 spaced) of the structural geology and geologic history of your specific map area and the larger region. *Refer to Mudge72.pdf in the 'MudgeMaps' Dropbox site.*

DUE March 11, 12 midnight. No Exceptions or Late Assignments.

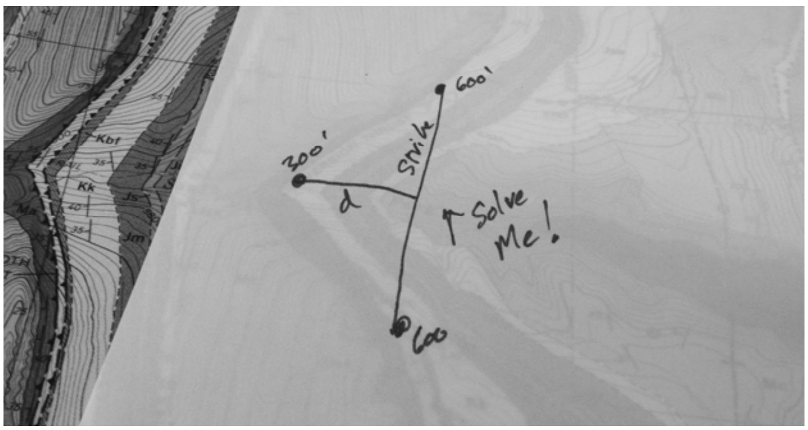
Attached [A]

GEOL3810 Structural Geology Winter 2014

Montana Map Project – 3Point Problems

You have an 8.5”x11” greyscale copy of your Montana map area. I have circled 6 locations – mostly on faults, but in some cases on formation contacts or igneous contacts – that you will do 3-point solutions for the attitude of the features that are circles.[COME SEE ME IF YOU ARE NOT CLEAR ON THE SPECIFIC FEATURES THAT ARE OUTLINED!].

1) Do the solutions using a combined graphical and mathematical technique on sheets of velum or white paper (6 soultions). See below – thousand words... (you use care and accurate techinique!):



2) Plot your 6 fault planes as great circles on a paper stereonet, as well as 3-4 strike and dip values from the map that are nearby – ideally on both sides of the fault.

3) Answer: a) Do you see any patterns in the fault dip data? Anything that may relate to the lithologies involved or the E-W or N-S location in the system? b) how do the S/D’s from the adjacent sediments compare to the fault? Any observations there?

GEOL 3910
Geologic Field Methods
Spring Quarter 2014
May 28, 2014

Hi Students,

Regarding the final report, it is time to start writing and drafting now. Below, I outline what is to be turned in on Friday 6/6/14 (no late reports accepted):

1) 5-7 pgs. written text; use the journal articles I have provided as templates (use Compton handouts as well),

2) all Mt. Diablo maps that you have used during your field work (these do not have to be inked),

3) final copy map (the two 11" x 17" sheets, taped together, rolled or folded), showing all your data inked and colored, with the cross-section location also shown, and

4) geologic cross-section, inked and colored as well; use only the bold 200 foot contours when drafting the topographic profile; show the shape of the fold where it has been removed by erosion (i.e. extrapolate the bedding above the topographic profile), and draw the section down to sea level.

I will place a map showing the cross-section line in the classroom tomorrow.

See you all Friday,

Dr. Kriens

CALIFORNIA STATE UNIVERSITY EAST BAY

Academic Roadmap

Department of Earth and Environmental Sciences
B.A. in Geology

Note: This roadmap is an example of one schedule that will enable you to graduate in four years. There are many different ways to complete the required coursework in a timely manner. Your actual schedule will likely be different.

YEAR 1 (0 – 45 UNITS)	FALL	UNITS	WINTER	UNITS	SPRING	UNITS	NOTES
	FLC:		FLC:		FLC:		GE: General Elective ME: Major Elective FLC: Freshman Learning Community (Cluster)
	GEOL 2101 - Physical Geology	(5)	GEOL 2102 - Earth & Life Through Time	(4)			Recommended Cluster: Molecules, Energy, and Living Things (Chem 1101, 1102, 1103). Fulfills both GE and major requirements.
	CHEM 1101 General Chemistry I OR PHYS 2701 Intro to Physics I	(5) OR (4)	CHEM 1102 General Chemistry II OR PHYS 2702 Intro to Physics II	(5) (4)	CHEM 1103 General Chemistry III OR PHYS 2703 Intro to Physics III	(5) OR (4)	
	MATH 1300 Trig & Analytical Geometry OR GE:	(4)	GE:		GE:		
	TOTAL UNITS		TOTAL UNITS		TOTAL UNITS		
					TOTAL UNITS FOR YEAR		

Year 1 (0 – 45 units)

You should . . .

Complete your Freshman Cluster Classes

and consider . . .

Taking General Education courses

CALIFORNIA STATE UNIVERSITY
EAST BAY

YEAR 2 (46 - 90 UNITS)	FALL	UNITS	WINTER	UNITS	SPRING	UNITS	NOTES
	GEOL 3601 - Mineralogy & Optical Crystallography	(5)	GEOL 3701 - Igneous & Metamorphic Petrology	(5)	GEOL 3801 - Sedimentology & Stratigraphy	(5)	GE: General Elective ME: Major Elective
	PHYS 1700 Elementary Physics (4) and PHYS 1780 Elementary Physics Lab (1) OR CHEM 1100 Intro to College Chemistry (5)	(5)	ME:	(4)	ME:	(4)	**ME: Major Electives (17 units):** *3000 and 4000 level GEOL courses (except GEOL 3040, 3050, 3051, 3100, and 3898) designed for GEOL majors (not GE courses) may be used to fulfill this requirement (a minimum of two courses must be 4000-level GEOL courses).*
	GE:		GE:		GE:		
	TOTAL UNITS		TOTAL UNITS		TOTAL UNITS		
					TOTAL UNITS FOR YEAR		

Year 2 (46– 90 units)

You should . . .

- Complete areas A1-A4
- Complete lower division GE requirements
- Complete English 1002
- Declare a major
- Meet with your major advisor
- Meet with an AACE advisor

and consider . . .

- Attend “Strictly Sophomores”
- Apply to CSSP or summer internship
- Explore student organizations
- Explore leadership opportunities

CALIFORNIA STATE UNIVERSITY EAST BAY

YEAR 3 (91 – 135 UNITS)	FALL	UNITS	WINTER	UNITS	SPRING	UNITS	NOTES
	ME:	(4)	GEOL 3810* Structural Geology	(5)	GEOL 3910* Geologic Field Methods	(3)	GE: General Elective ME: Major Elective **ME: Major Electives (16 units):** *3000 and 4000 level GEOL courses (except GEOL 3040, 3050, 3051, 3100, and 3898) designed for GEOL majors (not GE courses) may be used to fulfill this requirement (a minimum of two courses must be 4000-level GEOL courses).* *Note: GEOL 3810, 3910, and 4800 should be taken when offered, either during the junior (3rd) or senior (4th) year.
					GEOL 4800* Seminar	(2)	
	GE:		GE:		GE:		
	TOTAL UNITS		TOTAL UNITS		TOTAL UNITS		
					TOTAL UNITS FOR YEAR		

Year 3 (91– 135units)

You should . . .

- Take the Writing Skills Test in fall quarter
- Enroll in ENGL 3000 if needed
- Complete at least one upper division GE requirement

and consider . . .

- Meet with your major advisor
- Meet with AACE advisor
- Attend the Graduate School Fair
- Seek leadership opportunities in a club or student government

CALIFORNIA STATE UNIVERSITY EAST BAY

YEAR 4 (136 – 180 UNITS)	FALL	UNITS	WINTER	UNITS	SPRING	UNITS	NOTES
	ME:	(4)	ME:	(4)			GE: General Elective ME: Major Elective UE: Unrestricted Elective
	GE:		GE:		GE:		**ME: Major Electives (16 units):** *3000 and 4000 level GEOL courses (except GEOL 3040, 3050, 3051, 3100, and 3898) designed for GEOL majors (not GE courses) may be used to fulfill this requirement (a minimum of two courses must be 4000-level GEOL courses).*
	Unrestricted Elective:		Unrestricted Elective:		Unrestricted Elective:		
	TOTAL UNITS		TOTAL UNITS		TOTAL UNITS		
					TOTAL UNITS FOR YEAR		*Note: GEOL 3810, 3910, and 4800 should be taken when offered, either during the junior (3rd) or senior (4th) year.

Year 4 (136 – 180 units)

You should . . .

File for graduation
Complete upper division GE requirements
Take Major Requirement Electives (ME)

and consider . . .

Meet with major advisor
Meet with AACE advisor
Attend a Career Fair
Attend the Graduate School Fair
Conduct information interviews in your field

TOTAL UNITS ON PLAN	
MAJOR UNITS	
FRESHMAN CLUSTER UNITS	
GENERAL EDUCATION UNITS	
UNRESTRICTED ELECTIVE UNITS	

CALIFORNIA STATE UNIVERSITY EAST BAY

Academic Roadmap

Department of Earth and Environmental Sciences
B.S. in Geology

Note: This roadmap is an example of one schedule that will enable you to graduate in four years. There are many different ways to complete the required coursework in a timely manner. Your actual schedule will likely be different.

		UNITS	WINTER	UNITS	SPRING	UNITS	NOTES
	GEOL 2101 - Physical Geology	(5)	GEOL 2102 - Earth & Life Through Time	(4)	ME:	(4)	GE: General Elective ME: Major Elective FLC: Freshman Learning Community (Cluster) Recommended Cluster: Molecules, Energy, and Living Things (Chem 1101, 1102, 1103). Fulfills both GE and major requirements. The Math, Physics, and Chemistry sequences should be taken early in your academic career. Each of these sequences normally starts Fall Quarter.
	FLC: CHEM 1101	(5)	FLC: CHEM 1101	(5)	FLC: CHEM 1101	(5)	
	GE:		GE:		GE:		
	GE:		GE:		GE		
	TOTAL UNITS		TOTAL UNITS		TOTAL UNITS		
					TOTAL UNITS FOR YEAR		

Year 1 (0 – 45 units)

You should . . .

Complete your Freshman Cluster Classes

and consider . . .

Taking General Education courses

CALIFORNIA STATE UNIVERSITY EAST BAY

YEAR 2 (46 - 90 UNITS)	FALL	UNITS	WINTER	UNITS	SPRING	UNITS	NOTES
	GEOL 3601 - Mineralogy & Optical Crystallography	(5)	GEOL 3701 - Igneous & Metamorphic Petrology	(5)	GEOL 3801 - Sedimentology & Stratigraphy	(5)	GE: General Elective ME: Major Elective
	MATH 1304 - Calculus I	(4)	MATH 1305 - Calculus II	(4)	ME:	(4)	**ME: Major Electives** (27-30 units depending upon physics sequence completed): *At least 10 units must be in 4000-level geology courses. And up to 12 of the elective units may be satisfied with appropriate courses in Biological Sciences, Chemistry, Mathematics and Computer Science, Physics, and/or Statistics approved in advance by a faculty advisor.* GEOL 3110 (4), GEOL 3200 (1-2, no more than 4 units), GEOL 3400 (4), GEOL 4010 (5), GEOL 4130 (4), GEOL 4320 (4), GEOL 4800 (2, no more than 2 units), GEOL 4850 (2), GEOL 4900 (1-4), GEOL 4910 (2) (no more than 4 units for 4900 and 4910 combined) and other appropriate GEOL courses as approved by a faculty advisor.
	ME:	(4)	ME:	(4)	GE:		
	GE:		GE:		GE:		
	TOTAL UNITS		TOTAL UNITS		TOTAL UNITS		
					TOTAL UNITS FOR YEAR		

Year 2 (46– 90 units)

You should . . .

- Complete areas A1-A4
- Complete lower division GE requirements
- Complete English 1002
- Declare a major
- Meet with your major advisor
- Meet with an AACE advisor

and consider . . .

- Attend "Strictly Sophomores"
- Apply to CSSP or summer internship
- Explore student organizations
- Explore leadership opportunities

CALIFORNIA STATE UNIVERSITY EAST BAY

YEAR 3 (91 – 135 UNITS)	FALL	UNITS	WINTER	UNITS	SPRING	UNITS	NOTES
	PHYS 1001 Gen Physics I OR PHYS 2701 Intro Physics I	(5) OR (4)	PHYS 1002 Gen Physics II OR PHYS 2702 Intro Physics II	(5) OR (4)	PHYS 1003 Gen Physics III OR PHYS 2703 Intro Physics III	(5) OR (4)	GE: General Elective ME: Major Elective **ME: Major Electives** (27-30 units depending upon physics sequence completed): *At least 10 units must be 4000-level geology courses. And up to 12 of the elective units may be satisfied with courses in Biological Sciences, Chemistry, Mathematics and Computer Science, Physics, and/or Statistics approved in advance by a faculty advisor.* GEOL 3110 (4), GEOL 3200 (1-2, no more than 4 units), GEOL 3400 (4), GEOL 4010 (5), GEOL 4130 (4), GEOL 4320 (4), GEOL 4800 (2, no more than 2 units), GEOL 4850 (2), GEOL 4900 (1-4), GEOL 4910 (2) (no more than 4 units for 4900 and 4910 combined) and other appropriate GEOL courses as approved by a faculty advisor. *Note: GEOL 3810, 3910, and 4800 should be taken when offered, either during the junior (3rd) or senior (4th) year.
	ME:	(4)	GEOL 3810* Structural Geology	(5)	GEOL 3910* Geologic Field Methods	(3)	
	GE:		ME:	(4)	GEOL 4800* Seminar	(2)	
	GE:		GE:		GE:		
	TOTAL UNITS		TOTAL UNITS		TOTAL UNITS		
					TOTAL UNITS FOR YEAR		

GEOL 4000-level course on Field Geology, with consent of advisor (8), to be taken during summer session after third or fourth year, after GEOL 3810 and 3910.

Year 3 (91– 135units)

You should . . .

- Take the Writing Skills Test in fall quarter
- Enroll in ENGL 3000 if needed
- Complete at least one upper division GE requirement

and consider . . .

- Meet with your major advisor
- Meet with AACE advisor
- Attend the Graduate School Fair
- Seek leadership opportunities in a club or student government

CALIFORNIA STATE UNIVERSITY EAST BAY

YEAR 4 (136 – 180 UNITS)	FALL	UNITS	WINTER	UNITS	SPRING	UNITS	NOTES
	ME:	(4)	ME:	(4)	GE:		GE: General Elective ME: Major Elective **ME: Major Electives** (27-30 units depending upon physics sequence completed): *At least 10 units must be 4000-level geology courses. Up to 12 elective units may be satisfied with courses in Biological Sciences, Chemistry, Mathematics and Computer Science, Physics, and/or Statistics approved in advance by a faculty advisor.* GEOL 3110 (4), GEOL 3200 (1-2, no more than 4 units), GEOL 3400 (4), GEOL 4010 (5), GEOL 4130 (4), GEOL 4320 (4), GEOL 4800 (2, no more than 2 units), GEOL 4850 (2), GEOL 4900 (1-4), GEOL 4910 (2) (no more than 4 units for 4900 and 4910 combined) and other appropriate GEOL courses as approved by a faculty advisor. *Note: GEOL 3810, 3910, and 4800 should be taken when offered, either during the junior (3rd) or senior (4th) year.
	GE:		GE:		GE:		
	Unrestricted Elective:		Unrestricted Elective:		Unrestricted Elective:		
	TOTAL UNITS		TOTAL UNITS		TOTAL UNITS		
					TOTAL UNITS FOR YEAR		

Year 4 (136 – 180 units)

You should . . .
- File for graduation
- Complete upper division GE requirements
- Take Major Requirement Electives (ME)

and consider . . .
- Meet with major advisor
- Meet with AACE advisor
- Attend a Career Fair
- Attend the Graduate School Fair
- Conduct information interviews in your field

TOTAL UNITS ON PLAN	
MAJOR UNITS	
FRESHMAN CLUSTER UNITS	
GENERAL EDUCATION UNITS	
UNRESTRICTED ELECTIVE UNITS	