Syllabus for Geol 343-01 and 343-02
Field Geology of Plate Boundaries
Spring 2013

CRN: 578 (section 01) and 1407 (section 02)
Credits: 3.0
Prerequisite: GEOL 242 or ESCI 215 or instructor's consent
Class meets: MW, 8-850 am (section 01) and MW 3-350 pm (section 02)
Instructor: Les Hasbargen
Office: 219 Science 1 Ph. 607-436-2741
Office hours:
Personal web site: http://employees.oneonta.edu/hasbarle/index.html
Required Textbook: *"Rite in the Rain" All-Weather Geological No. 540F* field note book. You can find them online at http://www.amazon.com/gp/product/B0011DGJSC, ISBN 978-1-932149-35-7.
Optional Textbook: If you anticipate field work in your future, I recommend purchasing a copy of Geology in the Field, by Robert Compton (John Wiley and Sons, 1985; ISBN: 0-471-82902-1). This text provides a wealth of standard approaches to geologic data description and collection.

Course Description from the Undergraduate Catalog

GEOL 343 – Field Geology of Plate Boundaries – This course provides the opportunity for students to apply their in class theory to a field study experience. Students will record geologic observations in field notes and sketches; create maps and geologic cross sections; and present summaries of field investigations. Topic, site, and instructor may change upon each offering. Prior trips have visited the active plate margin in the western US, near Palm Springs in southern CA, and Death Valley National Park in eastern CA. The cost of the trip will vary based upon location. May be repeated for up to 9 s.h.

Course Overview

This field course examines the geology, surface processes, and geomorphology along a complex tectonic plate boundary in southern California. Students will decipher connections between modern depositional processes and environments and the sedimentary structures that are preserved in the rock record. Students will identify and characterize the various ways in which rocks deform. Students will develop geologic field mapping skills and gain experience in the construction of geologic maps and graphical representations of the geology in the area. A minimum of 9 students is needed for the trip to run. Costs should not exceed $1000 per student including air fare, food, lodging, transportation, and tuition. Students will stay in campgrounds. The field trip will take place over spring break, with additional classroom teaching during spring semester.

Course Justification

There is a persistent need for trained geoscientists with experience in geologic field investigation. This course will expose students in Geology, Earth Science, Environmental

Science, and Water Resources programs to an active plate tectonic boundary in the Mojave Desert of southern California, with most of the trip taking place in Rainbow Basin Natural Area (http://www.blm.gov/ca/st/en/fo/barstow/basin.html) and Mojave National Preserve (http://www.nps.gov/moja/index.htm). These locales provide extraordinary learning opportunities for students, exposing numerous faults and folds, a spectrum of rocks including clastic and chemical sedimentary rocks, intrusive and extrusive igneous rocks, and metamorphic rocks. The landscapes in the area exhibit premier examples of the interplay between surface processes and geomorphology, including uplifting mountains, huge landslides, dunes, playas, alluvial fans, volcanism, and desert pavement.

The focus of Geol 343 is on applied field observation—students integrate much of what they have learned in prior coursework in a real world context. The nearly 100% exposure of rocks and structures in the area offers a view into Earth's processes and the geologic record of past environments. In addition, the close juxtaposition of eroding mountains, and modern depositional settings for clastic and chemical sediments permits field based projects which couple stratigraphy with surface processes in a very direct way. Field exercises will require students to identify rocks, characterize erosive and depositional processes, and develop skills in collecting and analyzing spatial and geologic information. This course will be a profound learning experience.

The course will take place mostly on the field trip, which will run over Spring Break in late March, and with seminar-style lectures during the spring semester. Students will be evaluated based on participation on the field trip, field notes, field maps, and geologic cross sections.

Specific course objectives

Students will:

- develop skills in recording geologic observations in field settings;
- learn how to relate sedimentary features and structures to depositional environments and surface processes;
- learn how to map rock units;
- learn how to identify and map faults and folds;
- develop skills in graphical presentations of geologic data, including cross sections and map views; and
- recognize relationships between tectonic activity and landscape form

Student Learning Outcomes

Student Learning Outcomes for the Geology Major addressed by this course:

- Students will demonstrate their ability to describe and identify geologic materials. (GEOL-SLO #1)
- Students will demonstrate their understanding of how rocks, sediments, and soils form. (GEOL-SLO #2)
- Students will demonstrate comprehension of the role of deep time in Earth history. (GEOL-SLO #3)
- Students will demonstrate understanding of processes that occur on and within the Earth and interactions among Earth's systems. (GEOL-SLO #5)

- Students will demonstrate their ability to collect and analyze geologic information in field and laboratory settings. (GEOL-SLO #6)
- Students will demonstrate their ability to apply scientific reasoning and technology to solve geologic problems. (GEOL-SLO #8)
- Students will demonstrate their ability to work collaboratively to solve geologic problems (GEOL-SLO #9)
- Students will utilize scientific methods to design and execute research projects that include collection, analysis and interpretation of data. (GEOL-SLO #10)
- Students will demonstrate their ability to communicate scientific and technical information effectively through appropriate oral, visual and written presentation. (GEOL-SLO #11)

Student Learning Outcomes for the Earth Science Major addressed by this course:

- Students will demonstrate understanding of the governing concepts related to all components of the Earth system (meteorology, geology, oceanography, astronomy) and the relationships that link them. (ES-SLO #1)
- Students will demonstrate understanding of the structure of Earth's interior and the processes that operate within and on the Earth's surface, including a working knowledge of plate tectonics and natural hazards. (ES-SLO #4)
- Students will demonstrate their ability to describe and identify geologic materials and interpret the processes by which these materials form. (ES-SLO #5)
- Students will utilize scientific methods to design and execute research projects or solve problems that include collection, analysis and interpretation of data. (ES-SLO #7)
- Students will demonstrate their ability to communicate scientific and technical information effectively through appropriate oral, visual and written presentation. (ES-SLO #8)

Grades

Students will be evaluated based on **participation** (**5%**) on the field trip, **field notes (40%) and maps (30%)**, and **geologic cross sections** (**25%**).

Participation (5%) on the field trip, which includes asking questions in the field, assisting with tent set-up and tear down, doing dishes at the camp, helping with food preparation, cleaning up the camping area, and assisting with packing up camping gear.

Field notes (40%). These must include a record for each stop, including date, time, location (UTM GPS location), verbal descriptions, sketches, discussion, discoveries and comments on key themes at the stop.

Geologic maps (30%). Students will create geologic maps for the reconnaissance exercises at select sites including Rainbow Basin and Calico Mountains. Each map must have a descriptive title, author, date, scale, north indicator, and lithologic legend. The finished map (the desk copy) should have lithologic contacts, folds, faults, and rock orientation symbols clearly delineated. Lithologic units must be color-coded in the map and on the legend (desk copy only). The legend must include a description of the rock unit. Unconformities must be noted. Rock units in the legend must be in correct stratigraphic order, with youngest on top. Students are encouraged to

transfer their map data to a GIS format, but paper maps with legible writing and neatly drawn features will not receive less credit.

Geologic cross sections (25%). Students will create geologic cross sections from their geologic maps. The cross sections must have a descriptive title, author, date, vertical exaggeration, horizontal and vertical scales, topography, labeled ends of cross section that are keyed to map endpoints, correctly located fold axes and faults, neatly sketched (or computed) bedding surfaces and formation contacts, if present.

Late work will be marked down exponentially, with a decay rate of -0.25 per day, up to a limit of 5 days, at which point your grade ceases to decay, but the damage is done, so to speak. The equation is: $G(t) = G_0 e^{\lambda t}$, where $G(t)$ is your grade after it has decayed over time, G_0 is your grade if you submit your work on time, λ is the decay rate, e is Napier's constant (≈2.71828), and t is time in days. For example the table below shows the value of a report up to five days past due:

Days Late	Value of report
0	100%
1.0	78%
2.0	61%
3.0	47%
4.0	37%
5.0	29%

Note even if you are 5 days or more late, you will still get something for the exercise, and this is often the difference between a passing or failing mark for the course. **Do the work in the time allotted! You won't regret it! If you don't make the deadline, it's still worth it to hand them in.**

Rubrics for Course Exercises

A rubric identifies key parts of an exercise which will be evaluated, or ranked, based on a scale from 0 = no credit to 4 = excellent. What does each rank mean? This will vary based on what is being evaluated. In general:

0 = **No Credit**. This applies to an effort that would not receive a passing mark (below D-). There might be information provided, but the information is seriously flawed and the method of portraying that information (graphs, charts, maps, etc) obscures the true nature of the subject material.

1 = **Poor**. This applies to an effort that would receive a passing mark in the D range, and while passing, still has significant problems. *Some necessary information* is conveyed, but is missing pertinent details. The *method of portrayal* (graphs, charts, maps, etc.) is sloppy, and lacks definition and order. The *analysis of the data*, if one is asked for, is shallow and cursory.

2 = **Fair**. This applies to an effort that would receive a mark in the C range. The effort provides *necessary and sufficient content* to characterize the information, but it *lacks a thorough analysis* of the data, may not provide complete *background information* and needs improvement. *Organization and portrayal of the information* (graphs, charts, maps, etc.) could be improved.

3 = **Good**. This applies to an effort that would receive a mark in the B range. The effort provides *necessary content in a meaningful context*, an *adequate analysis in a clear fashion*, and a *useful portrayal* of information (graphs, charts, maps, etc.).

4 = **Excellent**. This applies to an effort that would receive a mark in the A range. The effort displays *clear, concise, accurate information* that is *organized and presented well*, *portrays the information clearly* (graphs, charts, maps, etc), and provides a *thorough and insightful analysis* of the results.

Rubric for Field Notes (40% of course grade)

Each stop must have the following elements (listed in the criteria) recorded in the field notes.

Weight (%)	Quality Points Awarded	Criteria
10	0-4	Date, time, location (GPS coordinates)
20	0-4	Purpose and Description of stop
40	0-4	Detailed notes of observations
30	0-4	Sketches

Quality Points: 4 = Excellent; 3 = Good; 2 = Fair; 1 = Poor (but passing); 0 = No credit

Rubric for Geologic Maps (30% of course grade)

Field and finished (office) copies of your geologic maps. Each office copy map will be evaluated based on the criteria below.

Weight (%)	Quality Points Awarded	Criteria
5	0-4	Lithologic contacts
5	0-4	Faults
40	0-4	Rock Orientation symbols, correctly plotted
15	0-4	Legend: Color-coded for lithologic units; all geologic symbols need a symbol (fault, strike-dip, contact, etc)
30	0-4	Verbal description of lithologic units in legend
5	0-4	Title, author, date, references for data sources, north arrow, scale

Quality Points: 4 = Excellent; 3 = Good; 2 = Fair; 1 = Poor (but passing); 0 = No credit

Rubric for Geologic Cross Sections (25% of course grade)

Weight (%)	Quality Points Awarded	Criteria
5	0-4	Title, author, date
10	0-4	Properly labeled axes, with directional indicators, keyed to a map
70	0-4	Properly located folds and faults, and correctly plotted layers
5	0-4	Correctly labeled layers on the cross section
5	0-4	Statement of vertical exaggeration
5	0-4	Overall appearance and clarity of the cross section

Quality Points: 4 = Excellent; 3 = Good; 2 = Fair; 1 = Poor (but passing); 0 = No credit

The rubric score will be re-scaled to the University curve according the following ranges: A: 100-87.5%, B: 87.5-62.5%, C: 62.5-37.5%, D: 37.5-8.3%, E: < 8.3%. The equation to rescale is $Grade_{university} = 0.3801 \times Grade_{rubric} + 56.386$, which yields a score as a percentage for the final grade assignments given by the standard University curve given below.

Percent	Grade	Percent	Grade	Percent	Grade	Percent	Grade
93-100	A	87-89.9	B+	77-79.9	C+	67-69.9	D+
90-92.9	A-	83-86.9	B	73-76.9	C	63-66.9	D
< 60	E	80-82.9	B-	70-72.9	C-	60-62.9	D-

Tentative Schedule for Field Trip

Date	Week Day	Day	Activity	Camp site
22-Mar	Friday	Day 1	Travel/Valley of Fire, Las Vegas	*Valley of Fire*
23-Mar	Saturday	Day 2	Hike Valley of Fire/Drive to Calico	*Calico*
24-Mar	Sunday	Day 3	Rainbow Basin, map east/north	*Calico*
25-Mar	Monday	Day 4	Rainbow Basin, map west/south	*Calico*
26-Mar	Tuesday	Day 5	Calico, map Wall Street Cyn	*Calico*
27-Mar	Wednesday	Day 6	Calico, map Wall Street Cyn	*Calico*
28-Mar	Thursday	Day 7	Blackhawk Landslide, Whitewater	*Whitewater*
29-Mar	Friday	Day 8	Map Whitewater	*Whitewater*
30-Mar	Saturday	Day 9	Amboy, Kelso Dunes	*Granite Mtns RS*
31-Mar	Sunday	Day 10	Lava Tube, Volcs, Hole in the Wall	*Hole in the Wall*
1-Apr	Monday	Day 11	Travel	*Oneonta*
2-Apr	Tuesday		School Starts	

Class Schedule (this schedule is subject to change as needed).

Date	**Week in sem.**	**Location**	**Activity**
Jan 16	Week 1	Organization	Field Trip
Jan-21	Week 2	Class does not meet	
Jan-28	Week 3	Class does not meet	
Feb-4	Week 4	Class does not meet	
Feb-11	Week 5	Lab: Describing rocks in the field	
Feb-18	Week 6	Lab: Mapping structures	
Feb-25	Week 7	Lab: Volcaniclastic rocks	
Mar-4	Week 8	Lab: GIS and Geologic Maps	
Mar-11	Week 9	Lab: GIS and Geologic Maps	
Mar-18	Week 10	Lab: Geologic Cross Sections	
Mar-25	Week 11	In the Field!!!	Spring Break!
Apr-1	Week 12	Field Notes DUE!	
Apr-8	Week 13	Work on maps	
Apr-15	Week 14	Work on maps	
Apr-22	Week 15	Work on cross sections	

Date	Week in sem.	Location	Activity
Apr-29	Week 16	Work on cross sections	
May 6	Week 17	**Maps/Cross Sections DUE!!!**	
May 15	Week 18	Final Exam: Course Wrap-up	8-10:30 am

Spring 2013 Calendar

January 13-15	Sunday-Tuesday	New Student Arrival & Orientation
January 16	Wednesday	Classes Begin
February 15	Friday	College Closes After Last Class
February 25	Monday	Classes Resume
March 22	Friday	College Closes After Last Class
April 2	Tuesday	Classes Resume
May 8	Wednesday	Follow Monday Class Schedule
May 9-15	Thursday-Wednesday	Finals
May 18	Saturday	Commencement

FINAL EXAM WEEK CLASS SCHEDULE
MAY 9 - 15, 2013
During the last week of the semester, day classes will meet for two and a half hour periods according to the schedule below. These periods are to be used for instruction and/or examination.

Date and Time	Thursday May 9	Friday May 10	Monday May 13	Tuesday May 14	**Wednesday May 15**
8:00am-10:30am	10 Tu Th	10 MWF	9 MWF	8:30 Tu Th	**8 MWF**
11:00am-1:30pm	2:30 Tu Th	12 MWF	11 MWF	1 Tu Th	2 MWF
2:00pm-4:30pm	11:30 Tu Th	1 MWF	4 MW	4 Tu Th	3 MWF

Note: All Evening Classes (Starting at 5:00pm or later only) will meet at their regularly scheduled times.

Policy on Academic Dishonesty

Academic dishonesty results in a loss of trust and open-ness which is the heart and soul of student-mentor relations. Plagiarism and cheating will not be tolerated in this course. Please see the Code of Student Conduct for definitions and repercussions of Academic Dishonesty (http://www.oneonta.edu/development/judicial/code.pdf).

ADA (Americans With Disabilities Act) Statement

All individuals who are diagnosed with a disability are protected under the Americans with Disabilities Act, and Section 504 of the Rehabilitation Act of 1973. As such, you may be entitled to certain accommodations within this class. If you are diagnosed with a disability, please meet with Student Disability Services (SDS), 209 Alumni Hall, ext. 2137. All students with the necessary supporting documentation will be provided appropriate accommodations as determined by the SDS Office. It is your responsibility to contact SDS and provide the teacher with your accommodation plan before a test.

Emergency Evacuation/Shelter-in-Place Procedures

In the event of an emergency evacuation (i.e. fire or other emergency), classes meeting in **Science 1** are directed to **reassemble at the Chase Gymnasium** so that all persons can be accounted for. Complete details of the College's emergency evacuation, shelter-in-place, and other emergency procedures can be found at http://www.oneonta.edu/security .

Course Expectations and Guidelines

I expect you to follow the guidelines for behavior below:

- Attend all classes and arrive punctually.
- If unavoidably late for a class, enter quietly and unobtrusively, and behave in other required ways to minimize distraction.
- Remain alert and attentive during lectures, discussions, and other class/lab activities.
- Avoid unnecessary conversation during lectures, discussions, and other class/lab activities.
- **Contribute to class experiences by asking relevant questions,** offering relevant examples or views, adequately answering questions posed by others, **engaging in critical and independent thought, and challenging both the instructor and the curriculum materials assigned for the course**.
- Demonstrate courtesy and respect in dealing with instructors and classmates.
- Recognize and seek to understand diverse points-of-view.
- Plan to spend 2 to 3 hours out-of-class time in academic study for every one hour of class attendance.
- Thoroughly plan and prepare for classes.
- Notify the instructor in advance, if possible, or in a timely fashion, if unable to attend a class or lab, take a scheduled exam or quiz, submit a scheduled assignment, or remain in the classroom for the entire class meeting because of unavoidable circumstances.
- You are expected to read each chapter before we cover it in class. This will allow you to formulate questions concerning material that is not clear, or that you would like to have covered in greater detail. I use lectures to focus on the most important aspects of the topic. I strongly encourage you to ask questions during lecture. There are no 'dumb' or 'stupid' questions. Often the questions you have are shared by others. You should view lectures as the time and place for discussion, and I welcome your thoughts and questions!
- Any reasonable accommodation will be provided for students with physical, sensory, learning, or psychiatric disabilities. Please contact me for assistance as early as possible.
- If English is not your primary language and you would like to have additional time in which to take the exams, let me know. Anyone who needs additional time for the exams will be extended the same courtesy.
- Academic dishonesty will not be tolerated and those engaging in it will be prosecuted. See the Academic Honesty & Dishonesty pamphlet published by the Dean of Students Office for further information.
- **Finally, turn off cell phones before coming to class!** A ringing (or singing!) phone is almost impossible for others to ignore. Especially the lecturer, who may wander so far off course that everyone will get upset...Of course, medical conditions can override this request.

Check list of Useful Items (Think Christmas Wish List!)

_____Hat—preferably wide brim to shade the ears/neck
_____Sunglasses
_____Hiking shoes
_____Sunscreen
_____Warm jacket
_____Gloves
_____Rain jacket
_____Undergarments
_____Long johns
_____Long-sleeved and short-sleeved shirt
_____Several pair of socks
_____A pair of long pants and shorts
_____Toiletries (check with airlines for permissible container sizes)
_____Towel
_____Flipflops or shower sandals
_____Sleeping bag (to 25°F) and small pillow
_____Sleeping mattress
_____Flashlight/headlamp
_____Eating utensils (fork, spoon, knife, plate/bowl, cup)
_____Water bottle (just make sure it's plane transport friendly; or buy water bottles in CA)
_____Camera (optional, but really helpful!)
_____Field book (with water resistant paper, such as Rite in the Rain)
_____*Compass with azimuth and inclinometer
_____Hand lens (see Geo-Tools for geology hardware: http://www.geo-tools.com/index.htm)
_____*Rock hammer (protective eye wear/goggles are a good idea)
_____Calculator
_____Whistle (in case you get lost)
_____Clipboard and/or map case (you can make your own with a clear plastic cover)
_____Pencils (mechanical pencils, or wood pencils with sharpener)
_____Pens and Permanent Marker
_____Protractor/6" ruler
_____*GPS unit
_____Charger for cell phone/electronic devices
_____Medium size duffel bag for clothes, sleeping bag, mattress, and personal items (choose a size within airline guidelines)
_____Day pack for lunch/snack items, pockets for water bottles, room for rain jacket, misc. tools
_____*Hard hat for caving

* Indicates item can be checked out from Earth & Atmospheric Sciences Dept

Waiver for Use of Photographs

Please initial the statements below and sign and date this form at the bottom, if you agree to the terms.

_____I understand that photographs will be taken of me during the course of this class field trip (Geol 343, Field Geology of Plate Boundaries Trip (Mojave-Rainbow), Spring 2013).

_____I grant permission to Earth & Atmospheric Sciences Department and SUNY Oneonta for the photographs to be used for educational and promotional purposes.

_____
Name (Please Print)

_____ _____
Signature Date

Key Themes

Tectonics

Transtension
Transpression
Pull-apart basins
Strike slip faults
Thrust faults
Normal faults
Restraining bends
Releasing bends
Chevron folds
Thin skinned deformation
Plate boundary
Transform boundary
Collisional boundary
Earthquake
Seismogenic zone

Geomorphology

Mountains
Lakes
Streams
Arroyos
Washes
Slot canyons
Alluvial fans
Dissected fans
Springs
Oases
Deltas
Scarps (erosional and fault)
Playas
Pavement
Ventifacts
Wind gaps
Dunes
Stream evolution
Badlands
Landslides
Debris flows

Intrusive rocks

Granite
Granodiorite
Pegmatite dikes
Mafic dikes
Felsite dikes
Xenoliths
Hydrothermal alteration

Sedimentary rocks

Sed. structures
Sedimentary Basins from Miocene to Pleistocene
Lacustrine
Deltaic
Fluvial
Evaporite
Fanglomerate
Transgressive sequence
Regressive sequence
Walther's law

Extrusive rocks

Lava flow
Tuff
Ash
Welded tuff
Pyroclastic flow
Dacite
Rhyolite
Andesite
Plugs
Caldera

Metamorphic rocks

Gneiss
Schist
Marble
Quartzite
Hornfels

Minerals

Barite
Orthoclase
Plagioclase
Quartz
Biotite
Chlorite
Muscovite
Magnetite
Tourmaline
Hornblende
Pyroxene
Olivine
Pyrite
Gypsum
Anhydrite
Calcite
Halite
Kaolinite
Illite

Cultural

Mines
Artifacts (morteros, geoglyphs, petroglyphs, fish traps)
Trails and roads

Environmental

Energy resources (geothermal, wind, solar)
Water usage
Climatic regions
National Monuments
Microclimates
Diurnal air movement
Environmental lapse rate
Sky islands
Rain shadows
Deserts
Alpine settings
Chaparral

Mapping Places

Mule Canyon (Calico)
Wall Street Cyn (Calico)
Rainbow Basin (Calico)
Whitewater Canyon