UCDAVIS
DEPARTMENT OF EARTH AND PLANETARY SCIENCES

Graduate Courses 2022-2023

Fall 2022

Course	Course Title	Units	Instructor	Breadth area
GEL 214	Active Tectonics	3	Oskin	1
GEL 251	Isotopes in Cosmochemistry and Geochemistry	3	Mukhopadhyay	2
GEL 262	Paleobiology Seminar	3	Motani	4
GEL 290	Seminar	1	Rudolph	N/A
GEL 294	Structure & Tectonics forum	1	Roeske	N/A
GEL 298	Planetary Geology and Geophysics *CRN: 35263* *Taught alongside GEL 163*	3	Stewart	3
GEL 390	Methods of Teaching Geology	2	Billen	N/A

Winter 2023

Course	Course Title	Units	Instructor	Breadth area
GEL 230	Geomorphology & River Management	3	Pinter	1
GEL 240	Geophysics of the Earth *Taught alongside GEL 162*	3	Rudolph	3
GEL 281	Instrumental Techniques	3	Yin	2
GEL 290	Seminar	1	Mukhopadhyay	N/A
GEL 298	Planetary Impact Processes *CRN: 26804*	3	Stewart	3

Spring 2023

Course	Course Title	Units	Instructor	Breadth area
GEL 205	Advanced Field Stratigraphy Topic: Tracing geobiological influences on the rock record of eastern California	3	Sumner	1
GEL 253	Petrology seminar Topic: Balancing science and disaster response during volcanic eruptions (and other natural hazards)	3	Cooper	1
GEL 290	Seminar	1	Pinter	N/A
GEL 294	Structure & Tectonics forum	1	Roeske	N/A
GEL 298	Aqueous Geochemistry *CRN: 45597*	3	Atekwana	2

Course Descriptions

Fall 2022

GEL 214: Active Tectonics (Oskin)
Graduate course breadth area: #1
Active Tectonics is lecture, project, and problem-set based course on tectonic processes taught through the lens of active systems. The course examines the interplay of tectonics and surface processes through observations, quantitative analytical, and numerical modeling techniques. Problem sets emphasize quantitative problem solving in structural geology, tectonics, geomorphology and Quaternary geochronology. We will also work on one or more group projects that vary from year to year, ideally with a fieldwork component.

GEL 251: Isotopes in Cosmochemistry and Geochemistry (Mukhopadhyay)
Graduate course breadth area: #2
Description coming soon.

GEL 262: Paleobiology Seminar (Motani)
Graduate course breadth area: #4
Description coming soon.

GEL 290: Seminar (Rudolph)
Does not count as a breadth or general course for graduate degree requirements.

GEL 294: Structure & Tectonics forum (Roeske)
Does not count as a breadth or general course for graduate degree requirements.
This on-going discussion group meets once/week to discuss a paper selected by participants in the group. The theme of the articles varies each quarter; the seminar's goal is to emphasize breadth and we read and discuss a range of articles that cover the diverse interests of members of the group. As an example, we have recently read articles on subduction zone processes, ranging from UHP metamorphism and exhumation, to response of the upper plate to degree of coupling in the subduction zone. If schedules allow, we plan a multi-day field trip to examine rocks that may show some of the processes of interest to the group and focus the reading around the field trip.

GEL 298: Planetary Geology & Geophysics (Stewart)
Graduate course breadth area: #3
CRN: 35263
Taught alongside GEL 163
Principles of planetary science. Planetary dynamics, including orbital mechanics, tidal interactions and ring dynamics. Theory of planetary interiors, gravitational fields, rotational dynamics. Physics of planetary atmospheres. Geological processes, landforms and their modification. Methods of analysis from Earth-based observations and spacecraft.
This course meets at the same time as GEL 163 and includes additional homework assignments.

GEL 390: Methods of Teaching Geology (Billen)
Does not count as a breadth or general course for graduate degree requirements.
Description coming soon.

Winter 2023

GEL 230: Geomorphology & River Management (Pinter)

Graduate course breadth area: #1

The course – widely known as "Ecogeo" – is a multidisciplinary study of the ecology, geomorphology, and management of rivers, floodplains, and watersheds. Each year, a single river is selected, and the course focuses on an intensive study of that system. The course involves classroom instruction during the academic quarter, research and research papers focused on the study river, culminating with a 7-10+ day rafting trip during which students collect and analyze field data and/or synthesize the multidisciplinary science, management, and policy of the river.

GEL 240: Geophysics of the Earth (Rudolph)

Graduate course breadth area: #3

Taught alongside GEL 162

This course presents foundational concepts in geophysics at a level accessible to all graduate students in the EPS department. Topics to be covered include the geophysical constraints on the large-scale structure and dynamics of Earth and planetary interiors such as seismology, gravity, heat flow, magnetic field, and geodesy. We will explore the physics of the processes that shape planetary surfaces and interiors including impact events, differentiation, mantle convection, and tectonics. The course will include a computer laboratory with hands-on programming activities in Python that reinforce the concepts covered in lecture.

Format: Lectures, weekly problem sets/labs, midterm, final

Note: This course is one of several regular 'core classes' being developed to strengthen our graduate curriculum.

GEL 281: Instrumental Techniques (Yin)

Graduate course breadth area: #2

Description coming soon.

GEL 290: Seminar (Mukhopadhyay)

Does not count as a breadth or general course for graduate degree requirements.

GEL 298: Planetary Impact Processes (Stewart)

Graduate course breadth area: 3

CRN: 26804

Planetary impact processes, including impact cratering mechanics and thermodynamics, catastrophic disruption, including introduction to hydrocodes, equations of state and state-of-the art in experimental capabilities.

Spring 2023

GEL 205: Advanced Field Stratigraphy (Sumner)

Graduate course breadth area: #1

Topic: Tracing geobiological influences on the rock record of eastern California.

This course will include ~7 days of fieldwork in areas between Mono Lake and the Death Valley area over spring break followed by 1 hour weekly meetings during spring quarter. Fieldwork will focus on

identifying and interpreting interactions between life and sedimentary systems in rocks ranging in age from Neoproterozoic to Cambrian with a few examples of recent deposits. Students will collect stratigraphic data and samples during fieldwork that will be analyzed during spring quarter for student-defined projects. Some reading will be assigned prior to fieldwork, and students participating in fieldwork are required to enroll in the spring quarter course.

GEL 253: Petrology seminar (Cooper)
Graduate course breadth area: #1
Topic: Balancing science and disaster response during volcanic eruptions (and other natural hazards)
Data collected during well-observed eruptions can lead to dramatic increases in our understanding of volcanic eruptions. However, the necessary shift to issues of public safety and hazard mitigation during a crisis means that scientific opportunities may be sacrificed. Thus, maximizing the scientific gains from eruptions requires planning and coordinating science activities among governmental organizations and academia before and during volcanic eruptions. The Community Network for Volcanic Eruption Response (CONVERSE) is an NSF-funded organization that is coordinating planning and strategic efforts through workshops and scenario-based activities, and is in the planning stages of building an NSF-funded Center around these topics.

The purpose of this course is to learn about volcanic eruption response and scientific efforts during eruptions. This will involve some lectures covering the basics of volcanic eruptions, hazards, and monitoring, and participating in a short volcanic eruption scenario. In addition, this course will be run in conjunction with similar courses at other institutions involved in CONVERSE (e.g., UC Berkeley, Lamont-Doherty Earth Observatory, University of Hawaii, University of New Mexico) and for 5-6 weeks of the course students will work with counterparts at these other institutions to develop materials for future eruption scenario exercises, as well as sharing input and ideas about how to maximize the science that can be done under these circumstances and how science can inform response efforts. Depending on the interests and expertise of students in the course, we will expand the scope of the topics covered to include other natural hazards and responses during the time when the course does not overlap with other institutions.

CONVERSE website: https://volcanoresponse.org

GEL 290: Seminar (Pinter)
Does not count as a breadth or general course for graduate degree requirements.

GEL 294: Structure & Tectonics forum (Roeske)
Does not count as a breadth or general course for graduate degree requirements.
This on-going discussion group meets once/week to discuss a paper selected by participants in the group. The theme of the articles varies each quarter; the seminar's goal is to emphasize breadth and we read and discuss a range of articles that cover the diverse interests of members of the group. As an example, we have recently read articles on subduction zone processes, ranging from UHP metamorphism and exhumation, to response of the upper plate to degree of coupling in the subduction zone. If schedules allow, we plan a multi-day field trip to examine rocks that may show some of the processes of interest to the group and focus the reading around the field trip.

GEL 298: Aqueous Geochemistry (Atekwana)
Graduate course breadth area: #2
CRN: 45597

The goal of this course is to discuss factors that affects the chemical composition of natural waters: (1) understanding of the main classes of reactions that control the behavior of major chemical species in natural waters and (2) learn to use some geochemical "tools" (including sampling and analyses equipment, software, etc.) to study major reactions in natural waters i.e., perform simple geochemical modeling. Students will acquire a basic understanding of the main classes of reactions, knowledge of the factors regulating chemical processes in natural waters, as well as the ways in which these processes influence the behavior of the major chemical species. Knowledge of a few basic pieces of information concerning the system of interest (e.g., temperature, pH, redox conditions, soil/sediment/rock composition, etc.) should allow students to readily apply such understanding to new situations to make reasonable predictions about the chemical composition of natural waters, and about the transport and fate of chemical species in natural waters.