

## Graduate Courses 2020-2021

### Fall 2020

Course	Course Title	Units	Instructor	Breadth area
GEL 232	Oceans and Climate Change	3	Gold, Vriesman, Fish, & Livsey	2
GEL 298	Coastal Ecogeomorphology <i>Application required for enrollment</i>	2	Pinter	5
GEL 298	Foundations of Paleobiology CRN: 35433	3	Gold	1
GEL 290	Seminar	1	Oskin	N/A
GEL 294	Structure & Tectonics forum	1	Roeske	N/A
GEL 390	Methods of Teaching Geology	2	Billen	N/A

### Winter 2021

Course	Course Title	Units	Instructor	Breadth area
GEL 214	Active Tectonics	3	Oskin	3
GEL 240	Foundations of Geophysics	3	Rudolph & Stewart	6
GEL 260	Paleontology	3	Vermeij	1
GEL 281N	Instrumental Techniques <i>In person lab</i>	3	Yin	N/A
GEL 290	Seminar	1	Yin	N/A
GEL 294	Structure & Tectonics forum	1	Roeske	N/A

### Spring 2021

Course	Course Title	Units	Instructor	Breadth area
GEL 250	Advanced Geochemistry Seminar <i>Topic: Snowball Earth</i>	3	Yin	4
GEL 251	Advanced Topics in Isotope Geochemistry and Cosmochemistry <i>Topic: Topics in Geochemistry</i>	3	Mukhopadhyay	4
GEL 290	Seminar	1	Gold	N/A
GEL 294	Structure & Tectonics forum	1	Roeske	N/A

## Course Descriptions

### Fall 2020

#### **GEL 232: Oceans and Climate Change (Gold, Vriesman, Fish, and Livsey)**

*Graduate course breadth area: #2*

This course is focused on the theme of biogenic calcite. Each week will cover a different sub-topic central to this theme: calcification, geochemistry, sclerochronology, morphology, microstructure, the evolution of biomineralization, and culturing. The course features a mix of student-led discussions, student-led activities, and talks from guest speakers who have expertise in each sub-topic. Students will be able to apply techniques and skills gained from this course to their own research disciplines and projects.

#### **GEL 298: Coastal Ecogeomorphology (Pinter)**

*Graduate course breadth area: #5*

Coastal Ecogeo is an interdisciplinary graduate seminar that will integrate the geology, ecology, and marine biology of Baja California Sur and the Sea of Cortez. The Sea of Cortez/Gulf of California is marginal sea that opened when the Baja California Peninsula was rifted off the western Mexican mainland at about 6 Ma. The Baja California margin of the Gulf of California makes an ideal natural laboratory for studying continental rifting and associated volcanic activity. The Gulf of California is also one of the most productive ecosystems in the world, thanks to upwelling of deep water from the Pacific into warm waters of the Gulf. This includes abundant fish, shrimp, sharks, sea lion and sea elephants, sea turtles, rays, and a wide variety of types of whales, as well as intertidal to shallow subtidal benthic marine invertebrates. The course will be followed by an optional, private kayaking trip along the eastern coast of Baja California in the vicinity of Loreto, Baja California Sur. Trip participants will be expected to help organize logistics for the field trip, including food, gear, transportation and field itineraries.

#### **GEL 298: Foundational Topics in Paleobiology (Gold)**

CRN: 35433

*Graduate course breadth area: #1*

This course covers basic principles of paleontology, evolution, ecology, and microbiology in order to provide graduate students with a common background. Students will learn how to recognize various modes of bias in the fossil record and develop testable hypotheses that account for these biases. An emphasis will be placed on computational tools, databases, and methodologies.

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

### Winter 2021

#### **GEL 214: Active Tectonics (Oskin)**

*Graduate course breadth area: #3*

Active Tectonics. This course examines tectonic processes through the lens of active orogens and surface processes. The course builds on foundational concepts in structural geology and geophysics, and introduces quantitative geomorphology as a means to

characterize and measure tectonic deformation. The course is lecture and problem-set based, culminating in a field trip and mapping exercises.

### **GEL 240: Foundations of Geophysics (Rudolph and Stewart)**

*Graduate course breadth area: #6*

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 260: Paleontology (Vermeij)**

*Graduate course breadth area: #1*

This course will explore a broad topic of interest (still to be decided). We will read and discuss relevant papers and there will be a short final presentation and paper.

### **GEL 281N: Instrumental Techniques (Yin)**

*Graduate course breadth area: N/A*

This course is designed to familiarize students with analytical facilities available in the Department of Earth and Planetary Sciences and in other campus and regional facilities. Each week there will be a lecture providing background on one or more instruments, followed by hands-on demonstrations and instruction in the lab. Students are expected to attend all lectures and labs, and all participants must register for the course. In addition to the scheduled lectures and labs, each student will be required to participate in one of group research projects using a particular instrument suite. Project results will be presented to the class and instructors by each group at the end of the quarter.

## **Spring 2021**

### **GEL 250: Snowball Earth (Yin)**

*Graduate course breadth area: #4*

The aim of the course is for the participants to catch up with some key development and arguments in the interdisciplinary fields of geology, geochemistry, geophysics and geobiology from the last two decades on the subject of Snowball Earth hypothesis. The course will be a combination of lectures by me on some key observations and arguments following Hoffman et al 2017 Science Advances review paper, followed by in depth discussion of some key papers from geology, geochemistry, geophysics and geobiology, led by the participating graduate students in the class. The papers will be selected from the 500 or so references in Hoffman et al (2017) as well as some most recent papers from 2017 to 2021.

It is a 3-credit graduate level course. We will have a first organizational meeting in the first week of Spring Quarter, 2021.

**GEL 251: Title (Mukhopadhyay)**

*Graduate course breadth area: #4*

Astrophysical context on origin of Solar System, synthesis of chemical elements, extinct radionuclides and planet formation, cosmochronology, building blocks of planets, and terrestrial volatile accretion. The course is lecture-based and with problem sets. Students should be familiar with geochemistry at the level of GEL 146, or have research interests in the topics covered, and/or be familiar with coupled linear differential equations.