

## Graduate Courses 2022-2024

### Fall 2022

Course	Course Title	Units	Instructor	Breadth area
GEL 214	Active Tectonics	3	Oskin	3
GEL 262	Paleobiology Seminar	3	Motani	1
GEL 290	Seminar	1	TBD	N/A
GEL 294	Structure & Tectonics forum	1	Roeske	N/A
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	5
GEL 240	Geophysics of the Earth	3	Rudolph	6
GEL 251	Thermodynamics for Earth and Planetary Scientists	3	Mukhopadhyay	4
GEL 281	Instrumental Techniques	3	Yin	N/A
GEL 290	Seminar	1	TBD	N/A

### Spring 2023

Course	Course Title	Units	Instructor	Breadth area
GEL 253	Petrology seminar	3	Ratschbacher	4
GEL 2XX	Aqueous Geochemistry	3	Atekwana	4
GEL 2XX	TBD	TBD	Sumner	TBD
GEL 290	Seminar	1	TBD	N/A
GEL 294	Structure & Tectonics forum	1	Roeske	N/A

### Fall 2023

Course	Course Title	Units	Instructor	Breadth area
GEL 227	Stable Isotopes Biogeochemistry	4	Atekwana	4
GEL 240	Geophysics of the Earth	3	Stewart	6
GEL 298	TBD	TBD	Mukhopadhyay	TBD
GEL 290	Seminar	1	TBD	N/A
GEL 294	Structure & Tectonics forum	1	Roeske	N/A
GEL 390	Methods of Teaching Geology	2	Billen	N/A

### Winter 2024

Course	Course Title	Units	Instructor	Breadth area
GEL 218	Analysis of Structures in Deformed Rocks	3	Cowgill	3
GEL 298	TBD	TBD	Stewart	TBD
GEL 2XX	Topics in Terrestrial Paleoclimatology	TBD	Montañez	TBD
GEL 290	Seminar	1	TBD	N/A

## Spring 2024

Course	Course Title	Units	Instructor	Breadth area
GEL 219	Fracture & Flow of Rocks	3	Billen	3 or 6
GEL 232	Oceans and Climate Change	3	Hill	2
GEL 251	Isotope Geochemistry & Cosmochemistry	3	Yin	4
GEL 253	Petrology seminar	3	Ratschbacher	4
GEL 290	Seminar	1	TBD	N/A
GEL 294	Structure & Tectonics forum	1	Roeske	N/A

## Course Descriptions

### Fall 2022

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

*Graduate course breadth area: #3*

Description coming soon.

**GEL 262: Paleobiology Seminar (Motani)**

*Graduate course breadth area: #1*

Description coming soon.

**GEL 290: Seminar (TBD)**

*Graduate course breadth area: N/A*

Description coming soon.

**GEL 294: Structure & Tectonics forum (Roeske)**

*Graduate course breadth area: N/A*

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 390: Methods of Teaching Geology (Billen)**

*Graduate course breadth area: N/A*

Description coming soon.

### Winter 2023

**GEL 230: Geomorphology & River Management (Pinter)**

*Graduate course breadth area: #5*

Description coming soon.

**GEL 240: Geophysics of the Earth (Rudolph)**

*Graduate course breadth area: #6*

Description coming soon.

**GEL 251: Thermodynamics for Earth and Planetary Scientists (Mukhopadhyay)**

*Graduate course breadth area: #4*

Description coming soon.

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

*Graduate course breadth area: N/A*

Description coming soon.

**GEL 290: Seminar (TBD)**

*Graduate course breadth area: N/A*

Description coming soon.

### Spring 2023

**GEL 253: Petrology seminar (Ratschbacher)**

*Graduate course breadth area: #4*

Description coming soon.

**GEL 2XX: Aqueous Geochemistry (Atekwana)**

*Graduate course breadth area: #4*

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.

**GEL 2XX: TBD (Sumner)**

*Graduate course breadth area: #TBD*

Description coming soon.

**GEL 290: Seminar (TBD)**

*Graduate course breadth area: N/A*

Description coming soon.

**GEL 294: Structure & Tectonics forum (Roeske)**

*Graduate course breadth area: N/A*

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.

## Fall 2023

### **GEL 227: Stable Isotopes Biogeochemistry (Atekwana)**

*Graduate course breadth area: #4*

Stable Isotopes biogeochemistry is an important discipline within the earth sciences. The use of stable isotopes is widespread from studies that seek to understand natural variations in isotopes in geologic system to those that relate to human perturbation of the world's ecosystems. This course is an introduction to the basic principles of stable isotope. Students will study of the production, distribution, and use of select naturally occurring stable isotopes applied to geology, hydrology, biogeochemistry, and environmental change. The main objective of this course is to provide an elementary understanding of the principles and application of stable isotope in earth and environmental systems. The course will focus on commonly used light stable isotopes (e.g., H, C, N, O and S). The course will also cover other stable and radioactive isotopes as appropriate. At the end of the course, students should have a working knowledge of the principles of stable isotopes and be able to apply their use in geologic studies and in their research.

### **GEL 240: Geophysics of the Earth (Stewart)**

*Graduate course breadth area: #6*

Description coming soon.

### **GEL 298: TBD (Mukhopadhyay)**

*Graduate course breadth area: #TBD*

Description coming soon.

### **GEL 290: Seminar (TBD)**

*Graduate course breadth area: N/A*

Description coming soon.

### **GEL 294: Structure & Tectonics forum (Roeske)**

*Graduate course breadth area: N/A*

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 390: Methods of Teaching Geology (Billen)**

*Graduate course breadth area: N/A*

Description coming soon.

## Winter 2024

### **GEL 218: Analysis of Structures in Deformed Rocks (Cowgill)**

*Graduate course breadth area: #3*  
Description coming soon.

**GEL 298: TBD (Stewart)**  
*Graduate course breadth area: #TBD*  
Description coming soon.

**GEL 2XX: Topics in Terrestrial Paleoclimatology (Montañez)**  
*Graduate course breadth area: #TBD*  
Description coming soon.

**GEL 290: Seminar (TBD)**  
*Graduate course breadth area: N/A*  
Description coming soon.

## Spring 2024

**GEL 219: Fracture & Flow of Rocks (Billen)**  
*Graduate course breadth area: #3 or 6*

This course is designed to provide students with a strong foundation in brittle, ductile, and viscous behavior of rocks. Emphasis is on brittle/ductile behavior of the lithosphere, including the rheologies used to model earthquake rupture and mechanisms of viscous deformation. For each topic, I will present the experimental data, the equations used to describe the behavior and a discussion of the microscopic origin of the observed behavior. Weekly homework assignments emphasize foundational concepts different types of deformation. Targeted paper discussions will occur at key junctures in the course to help synthesize the topics and learn how to critically read papers establishing or applying rheological concepts. Each student will also complete a literature review-based term project on a specific type of theology of relevance to their own research.

**GEL 232: Oceans and Climate Change (Hill)**  
*Graduate course breadth area: #2*  
Description coming soon.

**GEL 251: Isotope Geochemistry & Cosmochemistry (Yin)**  
*Graduate course breadth area: #4*  
Description coming soon.

**GEL 253: Petrology seminar (Ratschbacher)**  
*Graduate course breadth area: #4*  
Description coming soon.

**GEL 290: Seminar (TBD)**  
*Graduate course breadth area: N/A*  
Description coming soon.

**GEL 294: Structure & Tectonics forum (Roeske)**  
*Graduate course breadth area: N/A*

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.