

EPS 353: Earth Forces, 2021 (Pandemic Version_2)

Class, Tue & Thu, 10:00 – 11:30 am, Seigle 106

Lab, Wed, 2-4 pm, Rudolph 102

Instructor

Michael Wyession, Earth and Planetary Sciences, michael@wucore.wustl.edu, office hours by appointment.

Assistant to Instructor

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Course Description

This course is designed to provide students with a clear, exciting, and intuition-based understanding of the complex and interconnected structure and evolution of Earth. It is designed to address topics usually taught under the domain of “geophysics,” (thus the title, “Earth *Forces*”), and is designed to complement the other undergraduate foundations course, “Earth *Materials*,” E&PS 352. This course is designed to be able to be taken and appreciated by three different groups of students: 1) geoscience majors who plan to take higher-level geophysics courses, 2) geoscience majors who do not plan to take higher-level geophysics courses, and 3) students majoring in other sciences.

Prerequisites: One year of high school physics or chemistry.

Textbook

Lowrie, *Fundamentals of Geophysics, 2nd Edition*

Supplementary Textbooks (on reserve in the library):

Brown and Mussett, *The Inaccessible Earth*

Fowler, *The Solid Earth, 2nd Edition*

Lillie, *Whole Earth Geophysics*

Mussett and Khan, *Looking Into the Earth*

Sleep and Fujita, *Principles of Geophysics*

Stein and Wyession, *An Introduction to Seismology, Earthquakes, and Earth Structure*

Academic Integrity

Copying from another student or from material published conventionally or electronically is against the university’s academic integrity rules. I strongly encourage you to work together on homework and lab problems. However, each of you must write up your own answers. Suspected infractions of the university academic integrity policy will be taken to the Academic Integrity Committee of the College of Arts & Sciences.

Grading

Homework sets (including writing assignments and short quizzes) (55%), Labs (30%), and Paper/Final Project (15%). Homework and labs are due a week after being handed out. A 10% penalty applies to late work each day that it is late. Attending all lectures and lab periods is required (and expected).

Learning Expectations: By the end of the course, I expect students to be able to:

- Ask relevant questions about scientific topics
- Use and develop models to help understand geophysical concepts
- Analyze and interpret geophysical data
- Use mathematics to solve geophysical problems
- Construct explanations for geophysical phenomena
- Construct and defend arguments from geophysical evidence
- Obtain, evaluate, and communicate geophysical topics in a variety of styles and methods
- Work together in small groups to construct explanations or solve problems
- Write effectively in a variety of different writing styles

This is a writing-intensive course. There will be weekly writing assignments for much of the course.

Attendance, Participation, and Classroom Climate

Classroom attendance is expected. Class time will involve a combination of lecture, discussion, and problem solving. Lectures will preview material required for completing the homework assignments. It is recommended that students read the portions of the book related to the homework when it is assigned.

All classroom interactions are expected to remain civil, respectful, and supportive. For WashU's policy on Inclusive Learning, please see <https://diversity.wustl.edu/framework/advisory-best-practice-groups/inclusive-learning-environment/>.

University-Wide Policies

Statement on Military Service Leave

Washington University recognizes that students serving in the U.S. Armed Forces and their family members may encounter situations where military service forces them to withdraw from a course of study, sometimes with little notice. Students may contact the Office of Military and Veteran Services at (314) 935-2609 or veterans@wustl.edu and their academic dean for guidance and assistance. See: <https://veterans.wustl.edu/policies/policy-for-military-students/>.

Preferred Names and Gender Inclusive Pronouns

In order to affirm each person's gender identity and lived experiences, it is important that we ask and check in with others about pronouns. This simple effort can make a profound difference in a person's experience of safety, respect, and support. See: <https://students.wustl.edu/gender-pronouns-information/>, <https://registrar.wustl.edu/student-records/ssn-name-changes/preferred-name/>

Reporting Sexual Assault

If a student discusses or discloses an instance of sexual assault, sexual discrimination, sexual harassment, dating violence, domestic violence or stalking, or if a faculty member otherwise observes or becomes aware of such an allegation, they will keep the information as private as possible, but as a faculty member of Washington University, they are required to immediately report it to the Department Chair or Dean or directly to Ms. Jessica Kennedy, the University's Title IX Directory, at (314) 935-3118, jwkennedy@wustl.edu. Additionally, you can report incidents or complaints to the Office of Student Conduct and Community Standards or by contacting WUPD at (314) 935-5555. Students who wish to speak with a confidential resource may wish to reach out to the Relationship and Sexual Violence Prevention Center (RSVP) at 935-8761 or by visiting the 4th floor of Seigle Hall.

Accommodations for Sexual Assault

The University is committed to offering reasonable academic accommodations (e.g., no contact order, course changes) to students who are victims of relationship or sexual violence, regardless of whether they seek criminal or disciplinary action. If you need to request such accommodations, please contact the Relationship and Sexual Violence Prevention Center (RSVP) at rsvpcenter@wustl.edu or (314) 935-3445 to schedule an appointment with an RSVP confidential, licensed counselor. Information shared with counselors is confidential. However, requests for accommodations will be coordinated with the appropriate University administrators and faculty.

Emergency Preparedness

Before an emergency, familiarize yourself with the building(s) that you frequent. Know the layout, including exit locations, stairwells and the Emergency Assembly Point (EAP). Review the "Quick Guide for Emergencies" that is found near the door in many classrooms for specific emergency information and instructions. For additional information and EAP maps, visit emergency.wustl.edu. To ensure that you receive emergency notifications, make sure your information and cell phone number is updated in SIS, and/or download. The WUSTL app and enable notifications.

To report an emergency:

Danforth Campus: (314) 935-5555

School of Medicine Campus: (314) 362-4357
North/West/South and Off Campus: 911 then (314) 935-5555

Resources for Students

Disability Resources

Washington At Washington University we strive to make the academic experience accessible and inclusive. If you anticipate or experience barriers based on disability, please contact Disability Resources at 314.935.5970, disabilityresources@wustl.edu, or visit our website for information about requesting academic accommodations. See: <https://students.wustl.edu/disability-resources/>

The Writing Center

The Writing Center, located in Olin Library, offers free one-on-one writing tutorials to WashU students, as well as workshops designed to help students become better writers. The Writing Center staff can assist by providing feedback on the strength of an argument, clarity, and organization. Contact them at 935-4981 or writing@wustl.edu.

The Learning Center

The Learning Center works collaboratively with University partners to provide undergraduate students key resources, like academic peer mentoring, to enhance their academic progress. Contact them at learningcenter.wustl.edu to find out what support they may offer for your classes.

Mental Health Services

Mental Health Services' professional staff members work with students to resolve personal and interpersonal difficulties, many of which can affect the academic experience. These include conflicts with or worry about friends and family, concerns about eating or drinking patterns, and feelings of anxiety and depression. For more information, visit: www.students.wustl.edu/mental-health-services/

Relationship and Sexual Violence Prevention Center (RSVP)

The Relationship and Sexual Violence Prevention Center (RSVP) offers support for those who have experienced sexual violence, sexual misconduct, dating violence, domestic violence or stalking. RSVP can help those who are not sure what steps they wish to take to respond to their experiences. They offer confidential support and can help arrange for necessary classroom accommodations. To get help, contact the RSVP Center at 935-3445 or rsvpcenter@wustl.edu. Their office is located in Seigle Hall, Suite 435.

Bias Report and Support System (BRSS)

The University has a process through which students, faculty, staff, and community members who have experienced or witnessed incidents of bias, prejudice, or discrimination against a student can report their experiences to the University's Bias Report and Support System (BRSS) team. To report an instance of bias, visit www.brss.wustl.edu.

Center for Diversity and Inclusion (CDI)

The Center for Diversity and Inclusion (CDI) supports and advocates for undergraduate, graduate, and professional school students from underrepresented and/or marginalized populations, collaborates with campus and community partners, and promotes dialogue and social change to cultivate and foster a supportive campus climate for students of all backgrounds, cultures and identities. See: <https://diversityinclusion.wustl.edu/>

Schedule:

Date	Topic	Reading	Assignments Due
Jan 26:	Introduction to Forces and Energy		
27:	Introduction to Forces and Energy	Ch1.1	
28:	Introduction to the Earth		
Feb 2:	Plate Tectonics	Ch1.2: pp. 15-28	Quiz #1

	3: (online lab) Error Analysis		
	4: Plate Kinematics - 1	Ch1.2: 28-42	HW#1, Writing #1
	9: Plate Kinematics – 2		Quiz #2
	10: Lab [Plate Motions]		
	11: Plate Dynamics		HW#2, Writing #2
	16: Gravity: Size and Shape of Earth	Ch2.1-2.2	Quiz #3
	17: Lab		
	18: Gravity: Orbital Mechanics	Ch2.3	HW#3
	23: Gravity: Global	Ch2.4-2.5	Quiz #4
	24: Lab [Gravity –1]		
	25: Gravity: Regional Anomalies	Ch2.6	HW#4, Writing #3
Mar	2: Wellness Day		
	3: Wellness Day		
	4: Gravity: Isostasy	Ch2.7	No HW
	9: Rheology: Ductile Flow and Viscosity	Ch2.8.1-2.8.4	Quiz #5
	10: Lab [Gravity –2]		
	11: Rheology: Isostasy and Flexure	Ch2.8.5-2.8.6	HW#5, Writing #4
	16: Rheology: Structural Geology		Quiz #6
	17: Lab [Plate Flexure – 1 & 2]		
	18: Rheology: Stress and Strain and Waves	Ch3.1-3.3	HW#6, Writing #5
	23: Seismology: EQs and Seismometers	Ch3.4-3.5	Quiz #7
	24: Lab [Viscosity – Groups 1 & 2]		
	25: Seismology: 3D Tomography		HW#7, Writing #6
	30: Seismology: Reflection and Refraction	Ch3.6	Quiz #8
	31: Lab [Thermal Diffusion – Group 1]		
Apr	1: Seismology: Mantle and Core	Ch3.7	HW#8, Writing #7
	6: Composition: Rocks and Minerals	Brown&Mussett: Ch 6&7	Quiz #9
	7: Lab [Thermal Diffusion – Group 2]		
	8: Composition: Mantle and Core		HW#9, Writing #8
	13: Magnetism: Fields and Rocks	(skim) Ch5.1-5.2.6 and 5.4-5.7	Quiz #10
	14: Lab [Seismic Refraction]		
	15: Heat: Radioactivity and Geochronology	Ch4.1	HW#10
	20: Heat Flow	Ch4.2.1-4.2.5	Quiz #11
	21: Student Presentations – Part 1		
	22: Heat: Conduction	Ch4.2.6-4.2.8	HW#11
	27: Heat: Radiation and Climate		
	28: Student Presentations – Part 2		
	29: Convection & Mantle Dynamics	Ch4.2.9; Fowler: 509-555 (skim)	HW1#2
May	6: (Reading week)		HW#13
	11: (Tuesday of Finals week)		Research Paper Due