

Seismology and Seismic Methods – Fall 2023

**Geological Sciences
Univ. of Texas at El Paso**

**GEOP- 6354 CRN:16636
GEOP- 4420B CRN:16634
GEOP- 5354 CRN:16635**

**Classroom: GEOL 320
Instructor: Aaron A. Velasco
Office: 227B Geological Sciences**

**Tu.-Th., 9:00 - 10:20 AM, Lecture
Office Hours/Guest Speakers: Tu.-Th.,
Tu: 10:30-11:00 AM; Th: 8-8:30 AM (or
by appointment)
E-mail: aavelasco@utep.edu**

Course Goals and Objectives:

The main goals of the course are 1) to prepare students of seismology for further study of earthquakes and earth structure using seismograms, 2) to provide an overview of earthquake seismology for non-seismologists, 3) and to provide a foundation for the understanding of using seismic waves, using controlled sources, to determine detailed earth structure. An additional purpose of this course is to introduce students to the frameworks, concepts, and ideas of seismic investigation, especially reading journal articles and writing, plus learn problem-solving skills and become aware of the recent issues in the field.

Textbooks:

Foundations of Modern Global Seismology Ammon, Velasco, Lay, and Wallace
Exploration Seismology Sheriff and Geldart

Other resources

An Introduction to Seismology, Earthquakes and Earth Structure Stein and Wysession
Introduction to Seismology Shearer
Applied Geophysics Telford, Geldart, and Sheriff
The Elements of Style Strunk and White

Grades and Grading:

Grades will be calculated on the basis of homework assignments (computer-based and analytical), one mid-term exam, a term paper and presentation, a final exam, and participation. Homework assignments will account for 50% of the grade, a short mid-term exam 15%, a short term paper 15% (due Thurs., Apr. 28), a presentation of the paper 5%, a final exam 15%.

Grading on written assignments will be dependent on the level of student: Undergraduates, Masters, and Ph.D. For example, Ph.D. students will be expected to absorb and extend key concepts taught in the class in their term papers. Furthermore, a guest technical writer may review your summaries for style and grammar to provide writing feedback.

Homework:

Problem Sets

You will be assigned problem sets in class (approximately one per two weeks). The problem sets are due one week after they are assigned and will be due on Tuesdays at 11:59 PM. Turn in all assignments on Blackboard.

One-Page Summaries

You will be expected to review one recent (2018-2023) seismological journal article a week and provide me with a one page (or less) summary, due on Thursday of every week (first one is due Thurs. Jan. 27). I may provide several of the references, but the other assignments will be based on your own interests. **Use this as an opportunity to jump start your Papers/Projects!** The summaries must be in your own words (no copying of the abstract; attach a copy of the front page of the article to your summary). The journals should be from a variety of sources and must be on some seismology topic. The university has subscriptions to most of these journals, and many can be accessed electronically.

Masters and Ph.D. Students: Draw articles from Bulletin of the Seismological Society of America (BSSA), Journal of Geophysical Research (JGR), Geophysical Research Letters (GRL), Seismological Research Letters (SRL), Geophysical Journal International (GJI), Geochemistry, Geophysics, Geosystems (G³), Journal of Applied Geophysics, Geophysics, Earth and Planetary Science Letters (EPSL), Science, or Nature. You must receive prior approval to include other journals.

Undergraduates Students: Please draw articles from Geotimes, GSA Today, Scientific America, New Scientist, or any of the above. You must receive prior approval to include other journals.

The following information is required in your two-paragraph summary:

1. Header Information: Title, Journal, Author(s), your name
2. First Paragraph: Article Emphasis
 - What: State the article topic.
 - Why: State why the topic is an important problem to study.
 - Key Assumptions: Specify the key assumptions in the article.
 - How: Outline the authors' approach to the problem.
3. Second Paragraph - Reviewer Comments
 - Analysis and Results: Describe the analysis and results and assess if the results are valid and thorough. If so, why? If not, why not?
 - Discussion: Are the new results placed in proper context to other results from other research? What are the implications of the new results?
 - Conclusions: Do their results support their conclusion(s)? If not, why not? If so, please state what made the evidence compelling.

This exercise is intended to: 1) expose you to the latest issues that are being addressed in seismology and the breadth of those problems, 2) give you a head start on the term paper, and 3) get you into a good habit of reading the literature, which is key to staying on top of current issues in the sciences.

Exams:

The exams will be based on the homework and the textbook. The first exam will be on Tues. **Oct. 10, 2023**. I will open the exam for a full 24 hours (beginning at 8:00 AM), and it will be open notes/book. It will be on Blackboard, and you will have 80 minutes (typical class time) to complete it once you start. The final is scheduled for the week of **Dec. 11-14, 2022** and will also be open book/notes. I will open the exam for **Dec. 11-14**, and you will have 180 minutes (typical final time) to complete it once you start.

The Term Paper/Project

The term paper/project should be a concise but thorough review of some aspect of seismology (preferably inspired from your reading), and may be aligned with your current research. Example topics include a review of a topic not covered extensively in the course, or the documentation of the theory behind and development of a set of MATLAB scripts to perform a seismic computation. You can do your own research to supplement existing studies. The work must include references and illustrations; however, reference lists, illustrations, and MATLAB script listings do not count towards the page total. References should be cited throughout the text and bibliographies should be in a standard format such as that used by either the Journal of Geophysical Research or the Bulletin of the Seismological Society of America. Your writing

throughout the paper must be original, not copied from other works. Plagiarizing material will result in a non-negotiable zero on the paper.

Papers must be 8–15 pages long (of text; double spaced). You must have at least 10 references. To ensure you are progressing, you must turn in a **workplan**, outlining the chosen topic and the responsibilities for each. The *workplan is due before Oct. 10. Papers/projects are due Dec. 1*. Begin work early or you will have a difficult time completing the quality of paper that you want. You should discuss any topics selected with me before you begin a large project that will consume all of your time (& more). Periodically discuss your progress on the paper with me as the semester progresses. All of the summaries and your term paper should be submitted to SafeAssign, a plagiarism detecting software. SafeAssign is used to review assignment submissions for originality and will help you learn how to properly attribute sources rather than paraphrase. This is intended to be a good tool for you to make sure your writing is original.

Technology Requirements

Course content is delivered face to face. Ensure your UTEP e-mail account is working and that you have access to the Web and a stable web browser. Google Chrome and Mozilla Firefox are the best browsers for Blackboard; other browsers may cause complications. When having technical difficulties, update your browser, clear your cache, or try switching to another browser. You will need to have access to a computer/laptop, scanner ability (taking pictures works in many cases). We will be exploring using Python and/or MatLab, so I also suggest getting a UNIX account on our system (please speak with Carlos Montana about this).

If you do not have a word-processing software, you can download Word and other Microsoft Office programs (including Excel, PowerPoint, Outlook and more) for free via UTEP's Microsoft Office Portal. Click the following link for more information about [Microsoft Office 365](#) and follow the instructions.

IMPORTANT: If you encounter technical difficulties beyond your scope of troubleshooting, please contact the UTEP [Help Desk](#) as they are trained specifically in assisting with technological needs of students.

Course Communication: How we will stay in contact with each other

Because we may have online content, we can keep the communication channels open:

- **Office Hours:** I will still have office hours for your questions and comments about the course. My office hours will be held face to face or through zoom. You must request a meeting on zoom for us to set this up. Otherwise, you are welcome to come to my office.

- **Email:** UTEP e-mail is good way to contact me. I will make every attempt to respond to your e-mail within 24-48 hours of receipt.
- **Discussion Board:** If you have a question that you believe other students may also have, please post it in the Help Board of the discussion boards inside of Blackboard. Please respond to other students' questions if you have a helpful response.
- **Announcements:** Check the Blackboard announcements frequently for any updates, deadlines, or other important messages.
- them to a publicly accessible website, blog, or other space.

Excused absences and/or course drop policy

According to UTEP Curriculum and Classroom Policies, "When, in the judgment of the instructor, a student has been absent to such a degree as to impair his or her status relative to credit for the course, the instructor may drop the student from the class with a grade of "W" before the course drop deadline and with a grade of "F" after the course drop deadline." See academic regulations in the UTEP Undergraduate Catalog for a list of excuse absences. Therefore, if I find that, due to non-performance in the course, you are at risk of failing, I reserve the right to drop you from the course. If you feel that you are unable to complete the course successfully, please let me know and then contact the Registrar's Office to initiate the drop process. If you do not, you are at risk of receiving an "F" for the course.

Deadlines, late work, and absence policy

All deadlines are posted on BlackBoard. The weekly summaries are due at 11:59 PM the day they are due. No late work will be accepted if the reason is not considered excusable.

Make-up work

Make-up work will be given *only* in the case of a *documented* emergency. Note that make-up work may be in a different format than the original work, may require more intensive preparation, and may be graded with penalty points. If you miss an assignment and the reason is not considered excusable, you will receive a zero. It is therefore important to reach out to me—in advance if at all possible—and explain with proper documentation why you missed a given course requirement. Once a deadline has been established for make-up work, no further extensions or exceptions will be granted.

Alternative means of submitting work in case of technical issues

One thing is certain: technology will fail. I strongly suggest that you submit your work with plenty of time to spare in the event that you have a technical issue with the course

website, network, and/or your computer. I also suggest you save all your work in a separate Word document as a back-up. This way, you will have evidence that you completed the work and will not lose credit. If you are experiencing difficulties submitting your work through Blackboard, please contact the UTEP Help Desk. You can email me your back-up document as a last resort.

Incomplete grade policy

Incomplete grades may be requested only in exceptional circumstances after you have completed at least half of the course requirements. Talk to me immediately if you believe an incomplete is warranted. If granted, we will establish a contract of work to be completed with deadlines.

Accommodations policy

The University is committed to providing reasonable accommodations and auxiliary services to students, staff, faculty, job applicants, applicants for admissions, and other beneficiaries of University programs, services and activities with documented disabilities in order to provide them with equal opportunities to participate in programs, services, and activities in compliance with sections 503 and 504 of the Rehabilitation Act of 1973, as amended, and the Americans with Disabilities Act (ADA) of 1990 and the Americans with Disabilities Act Amendments Act (ADAAA) of 2008. Reasonable accommodations will be made unless it is determined that doing so would cause undue hardship on the University. Students requesting an accommodation based on a disability must register with the [UTEP Center for Accommodations and Support Services](#) (CASS). Contact the Center for Accommodations and Support Services at 915-747-5148, or email them at cass@utep.edu, or apply for accommodations online via the [CASS portal](#).

Scholastic integrity

Academic dishonesty is prohibited and is considered a violation of the UTEP Handbook of Operating Procedures. It includes, but is not limited to, cheating, plagiarism, and collusion. Cheating may involve copying from or providing information to another student, possessing unauthorized materials during a test, or falsifying research data on laboratory reports. Plagiarism occurs when someone intentionally or knowingly represents the words or ideas of another as ones' own. Collusion involves collaborating with another person to commit any academically dishonest act. Any act of academic dishonesty attempted by a UTEP student is unacceptable and will not be tolerated. All suspected violations of academic integrity at The University of Texas at El Paso must be reported to the [Office of Student Conduct and Conflict Resolution \(OSCCR\)](#) for possible disciplinary action. To learn more, please visit [HOOP: Student Conduct and Discipline](#).

Copyright statement for course materials

All materials used in this course are protected by copyright law. The course materials are only for the use of students currently enrolled in this course and only for the purpose of this course. They may not be further disseminated.

Course Resources: Where you can go for assistance

UTEP provides a variety of student services and support:

Technology Resources

- [Help Desk](#): Students experiencing technological challenges (email, Blackboard, software, etc.) can submit a ticket to the UTEP Helpdesk for assistance. Contact the Helpdesk via phone, email, chat, website, or in person if on campus.
- **Department Computing**: You can contact me and/or Carlos Montana (montana@utep.edu)

Academic Resources

- [UTEP Library](#): Access a wide range of resources including online, full-text access to thousands of journals and eBooks plus reference service and librarian assistance for enrolled students.
- [University Writing Center \(UWC\)](#): Submit papers here for assistance with writing style and formatting, ask a tutor for help and explore other writing resources.
- [Math Tutoring Center \(MaRCS\)](#): Ask a tutor for help and explore other available math resources.
- [RefWorks](#): A bibliographic citation tool; check out the RefWorks tutorial and Fact Sheet and Quick-Start Guide.

Individual Resources

- [Military Student Success Center](#): Assists personnel in any branch of service to reach their educational goals.
- [Center for Accommodations and Support Services](#): Assists students with ADA-related accommodations for coursework, housing, and internships.
- [Counseling and Psychological Services](#): Provides a variety of counseling services including individual, couples, and group sessions as well as career and disability assessments.

Table 1: Planned Topics for Seismology and Schedule

| Topics | Week/Deadline | Reading #: AVLW *: S&G |
|---|--|--|
| Seismology | | |
| 1. Introduction to Seismology 2. Sources: Faulting and Explosions 3. Propagation: Ray Theory Basics 4. Seismograms 5. Location 6. Magnitude and Statistics 7. Earth Structure 8. Refraction Surveys 9. Reflection Surveys/Processing 10. Geologic Interpretation | 1 1-2 3-4 5 6-7 8-9 10-11 11-12 13-14 14 | Ch. 1# Ch. 2# ,16# Ch. 12#,13# Ch. 5# Ch 6# Ch 7# Ch. 10# Ch. 11* Ch. 8*,9* Ch. 10* |
| Deadlines | | |
| Summaries Homework Papers/Projects Workplan Exam 1 Papers/Projects Final | Thurs., 11:59 pm (when assigned) Tues., 11:59 pm (when assigned) Oct. 10 Oct. 10 Dec. 1 Dec. 10 | |