



## Geophys 4231/6211 (Advanced) Seismic Interpretation

**Syllabus – Fall 2023**  
**Instructor: Dr. Kelly Liu**  
**Professor of Geophysics**

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**URLs:** <http://www.mst.edu/~liukh>; <http://sites.mst.edu/liukh>

**Lecture:** Mondays & Wednesdays 1:00 - 1:50 pm

**Lab:** (class#: 72220, 72218; Dis#: 71881): W-2-2:50 on selected week; See class schedule

**Room:** Lectures: McNutt 211, Labs: McNutt: B14; **Office hours:** by appointment

**GTA:** Mr. Qichao Zhao; Office: McNutt B40; Email: [qzfmn@mst.edu](mailto:qzfmn@mst.edu)

### Catalog Description

An introduction to 2-D/3-D seismic structural interpretation, stratigraphic interpretation, reservoir identification and evaluation, and horizon and formation attributes. The students are expected to master interactive 2-D/3-D seismic interpretation software packages that are routinely used in the petroleum industry. Prerequisite: Math 1208 or 1214; Geology 1110 or Geo Eng 1150.

### Course Objectives

This is a course designed for both undergraduate and graduate students:

- ❖ To acquire basic skills in interpretation of 2-D/3-D seismic data
- ❖ To gain theoretical knowledge of seismic structural interpretation, stratigraphic interpretation, reservoir identification and evaluation, and horizon and formation attributes
- ❖ To master the SMT-KINGDOM Suite seismic interpretation software

### Course Grading

**On-campus:** Course grade will be based on the labs on interpretation of seismic data on the geo-workstations and data processing (20%), a midterm exam (25%), course attendance and participation (5%), homework assignments (20%), and a final exam (30%).

**Distance:** Course grade will be based on the labs on interpretation of seismic data on the geo-workstations and data processing (20%), a midterm exam (25%), homework assignments (20%), and a final exam (35%).

**A:  $\geq 90\%$ ; B: 80%-89%; C: 70-79%; D: 60-69%; F:  $< 60$ .**

### Reference Books

- ❖ Interpretation of Three-Dimensional Seismic Data, 7th edn by Brown
- ❖ Basic Exploration Geophysics by Robinson and Coruh

### How to get a good grade

- ❖ Attend the lectures (you paid for this!)
- ❖ Participate in the in-class activities
- ❖ Listen carefully, think actively, and ask questions
- ❖ Read the related parts of the textbook before and after the lecture: Do not turn a page until you've understood all the material in it!
- ❖ Do the homework assignments independently (short-term "pleasure" versus long-term pain)
- ❖ Study for an exam early

**Tentative Course Schedule**

<b>Date</b>	<b>Content</b>	<b>Refs</b>
Week 1 Aug. 21	Introduction; Elasticity; Seismic body waves SMT Kingdom	Handout-Ch1
Week 2	Seismic surface waves; Snell's law; Critical refraction	H-Ch1
Week 3	Sept. 4 – Labor Day Holiday - no class Seismogram; Dynamic range Ray Parameters; Wave conversion Lab 1 –SMT Kingdom – color display	H-Ch1
Week 4	Reflected seismic waves Lab 2 – Data acquisition	H-Ch2
Week 5 Career Fair- Sept. 26	Acoustic Impedance; CDP Reflection Coefficient; Convolution	H-Ch3
Week 6	2D vs. 3D; Seismic display; Polarity and color Character and zero-phasesness Lab 3 – Refraction Data Interpretation	H-Ch3
Week 7	Seismic Phase <b>Midterm Exam</b>	Handout
Week 8	Structure interpretation Lab 4 - SMT Kingdom –fault interpretation	Brown- Ch 3
Week 9	Direct contouring and the importance of the strike perspective Lab 5 - SMT Kingdom – Synthetic seismic generation	B-Ch3
Week 10	Fault recognition and mapping; Interpretation in the vicinity of salt; Composite displays; Interpretation procedures; Visualization and autotracking Lab 6 –SMT Kingdom –Horizon interpretation	B-Ch3
Week 11	Stratigraphic interpretation Methods of making horizon slices; Horizon slice examples; Windowed amplitude; Reconstituting a depositional surface Lab 7 –SMT Kingdom – VuPak	B-Ch4
Week 12	Reservoir identification Bright & dim spots; Polarity reversal, Polarity and phase Lab 8 – SMT Kingdom	B-Ch5
Week 13	Use of frequency, amplitude variations with offset and shear waves Direct hydrocarbon indicators -examples	B-Ch5
Nov. 20-24	Thanksgiving Break – no class for the week	
Week 14	Seismic resolution; Reservoir evaluation	Handout; B-Ch7
Week 15	Net pay thickness; Pore volume; 4D Exploration	B-Ch8
	<b>Final exam (Comprehensive) – TBA</b>	

**Class Policies**

- ❖ Canvas will be used for course materials.
- ❖ **On-campus section:** class attendance and participation are required. Please come to classes on time. You need to get my pre-approval to receive credit for any absence.  
**Distance section:** you are welcome to attend the lectures and labs.

- ❖ Homework assignments are due at the beginning of class on the due date. Late works will not be accepted, unless you get the approval from the instructor before the deadline.
- ❖ Assignments must be completed independently. While discussions and collaborations are encouraged, homework problems must be solved independently.
- ❖ Concerns/issues related to a grade must be raised within a week after the grade was posted.
- ❖ The PPT file for the lecture should be available on Canvas before midnight on the day before the lecture. It is recommended that you bring a copy to the classroom and take notes on them.

### **Course Canvas overview and navigation message**

- The course content is located under “Modules” and organized in a sequential order. Each chapter is organized in a module, which contains lecture instruction ppts, other learning materials such as videos and animations, and homework assignments.

### **Communication plan**

- The best way to reach me is through email. I check my email frequently and will strive to answer all emails and questions within 24 hours. I can also be reached in-person during office hours and by appointments.

### **Feedback plan**

- We strive to return all graded work with feedback within one week after the due date.

## **Campus Instructional Support Systems and Resources**

**One Canvas.** (<https://umsystem.instructure.com/>) Use Canvas to post syllabi, policies, schedule(s), and grades.

**S&T Connect.** “Starfish” icon on Canvas toolbar.

S&T Connect enables students to request appointments with their instructors and advisors via the S&T Connect calendar, which syncs with the Outlook Exchange calendar. S&T Connect tracks each student’s performance across all courses. S&T Connect Early Alert enables students to be provided with services as needs arise.

**Reporting Academic Dishonesty.** Incidents involving behaviors such as cheating, plagiarism, or sabotage in an academic context must be reported to the instructor’s department chair and the Vice Provost of Undergraduate Education as violations of [the Student Academic Regulations](#). Such reporting is in addition to, and separate from, grade penalties for these violations as described in the instructor’s syllabus. An online form facilitates reports of academic dishonesty, accessed from the [Faculty Resources for Academic Integrity](#).

**Reporting Non-Academic Misconduct.** Students must uphold all non-academic misconduct standards in addition to the academic standards as outlined in the [University of Missouri Collected Rules and Regulations Section 200.010](#). Instances of non-academic misconduct, which may include but are not limited to disruption, obstruction, failure to comply, and/or forgery shall be reported to [Student Support and Community Standards](#) using the [online reporting form](#).

**Writing Center.** The Writing Center’s mission is to assist **all students** in their efforts to become better writers, communicators, and critical thinkers. They offer clients structured one-on-one and small-group conversations with peer consultants. Writing Center consultants are fellow students whose strong writing skills and special training allow them to offer meaningful feedback and guidance for any genre of writing. Students, faculty, and staff across all disciplines can make appointments in-person, online, and asynchronously. More information can be found at their website and through email: [writing@mst.edu](mailto:writing@mst.edu).

**Student Success Center.** The Student Success Center (SSC) supports student development through peer Academic Mentoring focusing primarily on STEM courses, Peer-to-peer soft skill coaching which can also act as an accountability buddy, and campus programming – all while providing free coffee and hot beverages! All undergraduate students are encouraged to utilize the SSC's free services to get timely support and to enhance their S&T Miner Experience. Visit the SSC at 198 Toomey Hall, contact us at [success@mst.edu](mailto:success@mst.edu) OR 573-341-7590. To see the course offerings and times for SSC Tutoring, visit <https://studentsuccess.mst.edu/academicmentoring/>.

**UCARE.** UCARE is the central point of contact to connect a student who may be experiencing a personal, academic, financial, wellbeing, and/or other concern to support and resources. Sharing your concern with UCARE helps connect a student with solution-focused assistance to support their holistic well-being, success, and academic progress. A referral can be submitted at <https://go.mst.edu/ucare-refer> or by emailing [ucare@mst.edu](mailto:ucare@mst.edu). For urgent matters, check out the [after-hour and urgent resources](#).

### **Statement about Copyright, FERPA, and Use of Video**

It is vitally important that our classroom environment promote the respectful exchange of ideas. This entails being sensitive to the views and beliefs expressed during discussions, whether in class or online. Please obtain instructor permission before recording any class activity. It is a violation of University of Missouri policy to distribute such recordings without authorization and the permission of all who are recorded. More information is provided [online](#).

### **Accessibility and Accommodations**

It is the university's goal that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on a disability, please contact Student Accessibility and Testing at (573) 341-6655, email [dss@mst.edu](mailto:dss@mst.edu), or visit <https://saat.mst.edu/> for information.

### **Student Honor Code and Academic Integrity**

- All students are expected to follow the [Honor Code](#).
- [Student Academic Regulations](#) describes the student standard of conduct relative to the University of Missouri System's Collected Rules and Regulations section 200.010, and offers descriptions of academic dishonesty including cheating, plagiarism, and sabotage, any of which will be reported to the Vice Provost for Undergraduate Education.
- Other resources for students regarding academic integrity can be found [online](#).

**Student Well-Being** (<https://wellbeing.mst.edu/>) Your well-being is important, and it contributes to your success in this course. At S&T, we provide resources to support your mental, physical, and social well-being. Any of us can experience challenges that make learning difficult. If you are struggling, take advantage of the following resources offered by the university:

**Student Well-Being** Student Well-Being provides counseling services, health promotion initiatives, and prevention programs to empower the S&T community to thrive and enhance personal, academic, and professional success. Department office hours are Monday-Friday, 8 a.m. – 5:00 p.m. On the website, you can find information related to confidential individual and group counseling, wellness consultations and trainings, resources for many health and wellness topics, and help for mental health crisis situations.

For the National Suicide Prevention Lifeline, call or text 988, or visit [missouri988.org](https://missouri988.org).

### **Health and Well-Being Canvas Course** (<https://umsystem.instructure.com/enroll/G3LY3G>)

The Health and Well-Being Canvas Course features trainings, presentations, and other health and well-being resources for students. The course is free for all students, is non-credit, and students can enroll at any point in the semester.

**Student Support and Community Standards** is your “Google Maps” for support. During your time at S&T, you or a friend may need help navigating the student experience, facing a barrier, or experiencing a challenge. You are not alone!

Student Support has a dedicated team and numerous resources such as [UCARE](#) and the [student emergency fund](#) to help you navigate the S&T experience and support your success. This includes support to address barriers related to academic, personal, emotional, medical, financial, or any other needs.

**Nondiscrimination, Equity, and Title IX** Missouri S&T is committed to the safety and well-being of our campus community, and to creating an environment free from discrimination and harassment.

The University does not discriminate on the basis of race, color, national origin, ancestry, religion, sex, pregnancy, sexual orientation, gender identity, gender expression, age, disability, protected veteran status, and any other status protected by applicable state or federal law. As used in this policy, the word “sex” is also inclusive of the term “gender.”

Additionally, US Federal Law Title IX states that no member of the university community shall, on the basis of sex, be excluded from participation in, or be denied benefits of, or be subjected to discrimination under any education program or activity. Sexual harassment violations of this law include quid pro quo, hostile environment, sexual assault, dating/domestic violence, and stalking. The U.S. Department of Education has stated the prohibition on discrimination on the basis of sex includes sexual orientation and gender identity.

Students who are experiencing pregnancy or pregnancy-related conditions, including the birthing parent and non-birthing parent, have rights protected under Title IX. Students should contact the Office of Equity and Title IX to learn more about their rights and pregnancy-related assistance/accommodations provided by the University to ensure equitable access to University educational programs and activities.

In accordance with the University of Missouri’s Collected Rules and Regulations, all faculty and staff are required to report any information concerning discrimination disclosed through communication including, but not limited to, direct conversation, email, social media, classroom papers and homework exercises to the Equity Officer/Title IX Coordinator.

**Office of Equity and Title IX**

Equity Officer and Title IX Coordinator: Dr. Paul Hirtz

Phone: (573) 341-7734

Location: 900 Innovation Drive, Suite 500

E-mail: [equity@mst.edu](mailto:equity@mst.edu)

**Classroom Egress Maps**

For all in-person instruction, faculty should explain where the classroom emergency exits are located. Classroom egress maps are posted at <http://designconstruction.mst.edu/floorplan/>.

**Student Veterans Resource Center**

The Student Veterans Resource Center (SVRC) is the nexus of resources and support for student veterans at S&T. The SVRC provides student veterans with a “safe space” and a familiar atmosphere. The center’s Veteran Consuls provide one-on-one consultations to guide students to various resources on campus, while its advisor provides students with VA health and benefits resources. Visit the SVRC at Harris Hall, Suite G10, and contact us at [svrc@mst.edu](mailto:svrc@mst.edu)

**USE YOUR TIME WISELY**