Course Syllabus: Course Syllabus: Environmental Geophysics
McCoy College of Science, Mathematics, and Engineering
GEOS 4844-201
Spring 2023

Contact Information

Instructor: Dr. Andrew Katumwehe
Office: Bolin 102A
Lecture: TR 3:00-4:20 PM B105
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Course Description

This course is a lecture-based overview of solid Earth, its properties and how we use those properties to understand geological processes using geophysical tools. It is focused on methods and approaches that are appropriate for the shallow targets. Lectures will cover only the most essential aspects of the 26 topics that comprise this course. The course introduces each geophysical method by presenting basic theory as well as its practical applications in exploring a given target. We will cover the various fundamental principles of experimental designs to support the theory and brief discussions on data acquisitions, how data is processed and interpreted.

We will examine the different shallow subsurface geophysical methods such as gravity which is based on the density contrast between different geological Units. One of the applications for gravity methods is mapping bedrock depth. Just like gravity method, magnetic methods are based on a magnetic field caused primarily by sources at the boundary between the inner and outer core. Many rocks and minerals are magnetized by induction in the Earth's field, and cause spatial perturbations or "anomalies" in the Earth's main field. Man-made objects containing iron or steel are often highly magnetized and can locally cause large anomalies up to several thousands of nT.
The electrical methods of prospecting depend on the marked resistivity contrast that exist between adjacent geological formations. These differences are produced by either variation in the porosity of the rocks or the nature of the saline solutions present. The electrical methods depend on whether current is injected in the ground and a potential difference is measured (active) or measuring the voltage of naturally occurring field (passive).

We shall look at seismic wave propagation using both refraction and reflection methods. The theory of wave propagation will be tested using the ground penetrating radar. In addition to the PowerPoint-based lectures, you are expected to read the appropriate chapters in the required course textbook. This course schedule has a list of specific topics and corresponding textbook readings. Lecture assignments and final exam will cover lecture materials and textbook-only topics. The final exam will not be cumulative; all prior material, topics, and text and assigned readings will be included on the final exam. Graduate students will be given extra assignments on top of what is given to the rest of the class.

The lab portion of the course has hands-on projects ranging from introducing you to geophysical instrument, the art of data acquisition, processing, interpretation and report writing. At the end of this course, you will be familiar with using geophysical tools, acquiring field data, processing and interpreting and integrating different geophysical data sets to solve a geological problem.
Active participation and completion of all lab sessions is a must. If you are going to miss a lab you must let Dr. Katumwehe know in advance. It is not possible to redo a lab since it requires more than 3 people to run a lab. A missed lab will receive a completion grade of zero. Note that some labs will consist of take home problem sets, whereas other labs will require use of software available on computers in Bolin 105.

Required Textbook & Instructional Materials
1- Introduction to Applied Geophysics by Burger, Sheehan, and Jones Norton 2006

Student Handbook
Refer to: Student Handbook 2021-22

Academic Misconduct Policy & Procedures
Academic dishonesty: Cheating, collusion, and plagiarism (the act of using source material of other persons, either published or unpublished, without following the accepted norm of crediting, or the submission for credit of work not the individual's to whom credit is given). Although I encourage you to discuss the lab problems and answers to some of the extra credit assignments with each other, your answers should be written only by you. However, it is unacceptable to turn in any work that is not your own. Cooperation = good. Plagiarism = not acceptable for your information industry is brutal to the lazy one. Additional guidelines on procedures in these matters may be found in the Office of Student Conduct. The expectation for all students in this course is that complete integrity will be demonstrated at all times. Violations may subject you to disciplinary action including the following: receiving a failing grade (0%) on an assignment, examination or course, receiving a notation of a violation of academic integrity on your transcript, and being suspended from the University. Violations of academic integrity will be reported for administrative action, and the penalties for such infractions will be as listed in the MSU policy on Academic Integrity.

Grading

Lecture portion of this course = 60% of final grade. Lecture Exam 1 = 10% of final grade; Lecture Exam 2 = 10% of final grade; Final Exam = 20% of final grade; Assignments=20% of final grade. Lab assignments =30%, while a research paper contributes 10% of the total grade. If you miss any of the classes make up is possible only if (1) you have a written excuse as to why you missed the exam and (2) you notified Dr. Andrew Katumwehe in advance that you would miss the exam. A missed exam or quiz must be made up within one week or you receive a grade of zero. Obviously, there may be extreme circumstances as to why prior notice was not given. These will be evaluated on a case-by-case basis. Note that oversleeping is not an acceptable reason! Please note that lab attendance, participation, lab exercise completion and homework assignments (usually one per week) will determine your overall Lab completion grade. All lab assignments must be turned in within one week of original due date. After two weeks, a grade of zero will be given for a late assignment. Research Paper grade is 20% of the final grade and this grade will be derived as follows - 50% from submitted text and 50% from presentation. Presentation is limited to 15 minutes and will be followed by 5-10 minutes for questions from peers, lab TAs, instructor, and/or guests. Research papers must be between 2250 and 3250 words (about 4-6 pages of text based on 11-pt or 12-pt font; word count per MSWord's word count tool) and be no longer than ten total pages including illustrations and title page. Papers will contain an abstract no more than 250 words (not included in word count) and highlights of the paper. At least three primary, peer reviewed references, and be structured as follows: (1) Title page with title and author; (2) Abstract and highlights; (3) Introduction (background and rationale for paper topic choice); (4) Discussion (basically what you learned and want to share with your colleagues as a result of your research); (5) Conclusion (highlight of most important learning's from your perspective and why you chose the particular topic); and (6) references (minimum of five primary references). Figures and/or tables (with captions and references) may be included within the text or at end of paper. Format – MS Word; paper copy and electronic copy to be submitted per the course schedule. Papers submitted one week late will be docked one letter grade (e.g. 10 points; thus a paper that would have received an 85% grade if submitted on time will receive a final grade of 75% if submitted one week late). Research papers submitted more than two weeks late may be given a grade of zero. Papers must be submitted in both printed and electronic form (MS Word). The latter should be submitted via Dr. Andrew Katumwehe's University email at andrew.katumwehe@msutexas.edu with the words "GEOS4844 Paper spring2023" along with your paper title on the email subject line. Note that the exams, lab quizzes, and lab completion grades are typically normalized ("curved") by simple arithmetic adjustment so that the class grade average is between 76-80%. However, this is only curved for students who have consistently attended and handed in their assignments, quizzes, research paper and exams. All components of your final grade must be submitted by May 01. The homework assignments will be posted on D2L. The homework assignments will include questions to answer that focus on lecture and lab content. Homework

due dates are listed in the syllabus. Note: No homework, lab assignments, or research papers may be submitted after 05/04/2023. The Table below (next page) summarizes the grading policy for this course.

Table 1: Points allocated to graded item or group of items discussed in the Grading Section above.

Graded Items	**Contribution to Final Course Grade**
Exam 1	10%
Exam 2	10%
Final Exam	20%
Lecture Assignments	20%
Lab Grade (includes lab quizzes, lab participation and attendance, homework assignments)	30%
Research Paper	10%

Table 2: Final grade determination (grades are rounded up to the nearest integer before assigning the final course letter grade. This means, for example, that a final calculated course grade of 89.8% will be rounded up to a final course grade of 90.)

Grade	**Points**
A	90 and above
B	80-89
C	70-79
D	60-69
F	Less than 60

Homework
See Grading Section for details – All Homework to be submitted to my office in your regular lab section

Lab Assignments
See Grading Section for details – All lab Assignments to be submitted to me during your regular lab section meeting.

Lab Attendance Policy – Important!

- Students who **miss three** or more lab section meetings may be dropped from the course by the instructor. Students are responsible to work with their lab section TA to make up any missed material in a timely fashion. Students must notify their lab TA and Dr. Katumwehe by email in advance of missing a lab section. Students **who leave lab sections and class early may be marked**

absent, geophysical labs are labor intensive in putting them up and putting them down. However, any proximal interaction, including supervision or collegial interaction in the class, lab and outside during demonstration requires individual protection.

- The SARS-Cov2 virus is a threat to the execution of this class. We will replicate conditions that have been useful to healthcare workers. Our shared responsibility and approach must be to continue to monitor and adapt to the changing dynamics of the virus just as other Texas cities, corporations, and institutions are doing in recent days. As such, we once again on you to remain vigilant and take steps to prevent the spread of COVID-19.

Exams
Three lecture exams are included in your course grade; see Grades section for details. All exams will have a time limit of 50 minutes for the two "midterm" exams and 110 minutes for the final exam.

Research Paper
See Grading Section for details about content and format. All Research Papers must be submitted in Microsoft Word or PDF format to andrew.katumwehe@msutexas.edu and paper copy to my physical mailbox in Bolin 102A.

Lecture (attendance) Extra Credit
Limited extra credit opportunities will be available on an irregular and random basis during the lecture portion of the course. Each individual extra credit opportunity will be worth up to one (1.0) extra credit point. Generally, these opportunities involve a short written response to a question or problem posed during the lecture or more often than not, simply your signature on attendance sheet (therefore, bring paper and pen/pencil to lectures and printouts for the presentations).

Important Dates
The last Day to drop this course with a W is March 27th 2023 at 4pm and is found in the University 2022 fall calendar under Drops, Withdrawals & Void

Desire-to-Learn (D2L)
The MSU D2L program is a part of this course. Lectures, review materials, and course information are available through D2L. You can log into D2L through the MSU Homepage. If you experience difficulties, please contact the technicians listed for the program or contact your instructor.

Computer Requirements
Geophysics requires considerable use of excel and other computer programs. It is your responsibility to have (or have access to) a working computer in this class. Assignments and tests are due by the due date, and personal computer technical difficulties may not be considered as a reason for the instructor to allow students extra time to submit assignments, tests, or discussion postings. Computers are available on campus in various areas of the buildings as well as the Academic Success Center. Your computer being down is not an excuse for missing a deadline or an exam! Contact your instructor immediately upon having personal computer trouble. If you have technical difficulties in the course, there is also a student helpdesk available to you. The college cannot work directly on student computers due to both liability and resource limitations.

Change of Schedule
A student dropping a course (but not withdrawing from the University) within the first 12 class days of a regular semester or the first four class days of a summer semester is eligible for a 100% refund of applicable tuition and fees. Dates are published in the Schedule of Classes each semester.

Refund and Repayment Policy
A student who withdraws or is administratively withdrawn from Midwestern State University (MSU) may be eligible to receive a refund for all or a portion of the tuition, fees and room/board charges that were paid to MSU for the semester. However, if the student received financial aid (federal/state/institutional grants, loans and/or scholarships), all or a portion of the refund may be returned to the financial aid programs. As described below, two formulas (federal and state) exists in determining the amount of the refund. (Examples of each refund calculation will be made available upon request).

Services for Students with Disabilities
In accordance with Section 504 of the Federal Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990, MSU endeavors to make reasonable accommodations to ensure equal opportunity for qualified persons with disabilities to participate in all educational, social, and recreational programs and activities. After notification of acceptance, students requiring accommodations should make application for such assistance through Disability Support Services, located in the Clark Student Center, Room 168, (940) 397-4140. Current documentation of a disability will be required in order to provide appropriate services, and each request will be individually reviewed. For more details, please go to Disability Support Services.

College Policies
Campus Carry Rules/Policies are given here: Campus Carry Rules and Policies

Smoking/Tobacco Policy
College policy strictly prohibits the use of tobacco products in any building owned or operated by MSU. Adult students may smoke only in the outside designated-smoking areas at each location.

Alcohol and Drug Policy
To comply with the Drug Free Schools and Communities Act of 1989 and subsequent amendments, students and employees of MSU are informed that strictly enforced policies are in place, which prohibits the unlawful possession, use or distribution of any illicit drugs, including alcohol, on university property or as part of any university-sponsored activity. Students and employees are also subject to all applicable legal sanctions under local, state and federal law for any offenses involving illicit drugs on University property or at University-sponsored activities.

Grade Appeal Process
Students who wish to appeal a grade should consult the Midwestern State University appeal of course grade and grade appeal checklist

Notice
Changes in the course syllabus, procedure, assignments, and schedule may be made at the discretion of the instructor. These changes will be communicated to all students through D2L**.** Please check the course news on a regular basis for schedule updates. The course schedule detail is given on the next page. The table lists lecture topics, textbook readings, and the three lecture exams.

Campus Carry and Active Shooter
Campus Carry
Effective August 1, 2016, the Campus Carry law (Senate Bill 11) allows those licensed individuals to carry a concealed handgun in buildings on public university campuses, except in locations the University establishes as prohibited. The new Constitutional Carry law does not change this process. Concealed carry still requires a License to carry permit, and openly carrying handguns is not allowed on college campuses. For more information, visit Campus Carry.

Active Shooter
The safety and security of our campus is the responsibility of everyone in our community. Each of us has an obligation to be prepared to appropriately respond to threats to our campus, such as an active aggressor. Please review the information provided by MSU Police Department regarding the options and strategies we can all use to stay safe during difficult situations. For more information, visit Safety / Emergency Procedures. Students are encouraged to watch the video entitled "Run. Hide. Fight." which may be electronically accessed via the University police department's webpage: "Run. Hide. Fight."

Course Schedule – Lecture Topics and Exams, Text Reading (Page 1 of 3)

Date	Topic and Topic Number	Textbook Pages
17-Jan	Course overview, techniques and targets	Pages 1-349
18-Jan	Potential Field: Methods-Gravity methods	Pages 349-427
20-Jan	Potential Field: Methods-Gravity methods	Pages 349-427
24-Jan	Potential Field: Methods-Gravity methods **Assignment 1-Gravity methods**	Pages 349-427
25-Jan	Gravity methods-Lab	
27-Jan	Potential Field: Magnetic Methods	Pages 429-497
31-Jan	Potential Field: Magnetic Methods	Pages 429-497
02-Feb	Potential Field: Magnetic Methods **Assignment 2- Magnetic Methods**	Pages 429-497
07-Feb	Magnetic methods-Lab	
08-Feb	**Exam 1: Gravity and Magnetics**	
09-Feb	Electrical methods: Resistivity Method	Pages 265-335
14-Feb	Electrical methods: Resistivity Method	Pages 265-335
15-Feb	Electrical methods: Resistivity Method **Assignment 3- Resistivity Method**	Pages 265-335
16-Feb	Resistivity Method Lab	
21-Feb	Seismic Methods – Refraction Seismology	Pages 7-263
22-Feb	Seismic Methods – Refraction Seismology	Pages 7-263
23-Feb	Seismic Methods – Reflection Seismology	Pages 7-263
28-Feb	Seismic Methods – Reflection Seismology **Assignment 4- Seismic Methods**	Pages 7-263
02-Mar	**Exam 2: Resistivity & Seismic Methods**	
07-Mar	Electrical and Electromagnetic methods-Instantaneous Potential (SP)	Pages 499-553
08-Mar	Instantaneous Potential (SP)	Pages 499-553
09-Mar	Instantaneous Potential (SP)	Pages 499-553
13-18-Mar	**Spring Break - No Class**	
21-Mar	Induced Polarization (IP)	Pages 499-553
22-Mar	Induced Polarization (IP)	Pages 499-553
23-Mar	Electromagnetic methods (EM)	Pages 499-553
28-Mar	Electromagnetic methods (EM)	Pages 499-553
29-Mar	Induced Polarization (IP)	Pages 499-553
30-Mar	Induced Polarization (IP)	Pages 499-553
02-Apr	Induced Polarization (IP)	Pages 499-553
03-Apr	Ground Penetrating Radar	Pages 499-553
04-Apr	Ground Penetrating Radar	Pages 499-553
08-9 Apr	Holiday Break-No Class	
10-Apr	Ground Penetrating Radar Lab	
11-Apr	**Assignment 5- EM, IP and GPR**	

Date	Topic and Topic Number	Textbook Pages
24-30 April	**Final Research Presentation and submission**	Assignment 5 submitted
02-May	**Final Review**	
09-May. Tuesday	**Final Exam 8.00-10:00AM**	