

Course Syllabus: Applied Petroleum Geology
McCoy College of Science, Mathematics, and Engineering
GEOS 4134 and PETE 4203 (co-listed)
Spring 2024

Contact Information

Instructor: Dr. W. Scott Meddaugh

Office: Bolin 307F and Zoom

Office hours: "Drop in" office visits will be handled via Zoom. Additional detail in D2L

Office phone: (940) 397-4469. Messages may be left, but email is preferred as email tends to be answered quicker.

University e-mail: scott.meddaugh@mwsu.edu

Course Instructional Mode

This course will be presented on campus though a shift to online may be needed due to possible Covid-related issues. All lectures will be provided in D2L as voice-over .mp4 files and standard printable .pdf files for students in quarantine. Labs will be presented in Bolin 105 during normal lab time (Mondays, 1-2:50pm) using materials provided in D2L. If it is necessary to do labs online, the labs will be presented via Zoom or as voice-over .mp4 files and standard printable .pdf files. Lectures (video and PowerPoint), Lab Assignments, and Homework Assignments will be provided in D2L. All regular exams will be administered in person or online using D2L. Note that the Final Exam may be project-based rather than a "regular" exam. ***Additional requirements for Graduate Students are in orange, bold, italic text in this syllabus. Graduate students will have additional exam questions, additional components on lab and homework assignments, and must submit a longer and more detailed research paper and presentation.***

Note that all D2L-related issues and technical problems should be handled via D2L support at this link: <https://msutexas.edu/distance/online-courses.php> prior to the start of the semester. You may need to be able to provide homework, lab reports, and research paper in a format compatible with D2L (e.g. .doc, .pdf, .jpeg, etc. based on your hardware/software of choice. Files for the D2L drop boxes may be generated by software on your computer, image files obtained via scanning (many printers have this capability), or by submitting an image file obtained using a cell phone. Note that Apple specific formats such as ".heic" or ".pages" files cannot be read within D2L at the present time. Software that students are expected to have access to includes Microsoft Office or equivalent.

Course Description

A Lecture and Lab-based course focused on applied aspects (geological and engineering) of conventional and non-conventional oil and gas reservoirs. The course consists of three modules. The first module is focused on the practical

aspects of petroleum geology and reservoir engineering. The second module is focused on practical reservoir characterization using well log, core, and engineering/production data. The third module is focused on volumetric appraisal and reserve estimation using classic "static" techniques as well as modern uncertainty-based workflows. The third module also includes specific "business-focused" topics including the use of decision trees, value of information (VOI) exercises, and related financial-aspects of the oil and gas industry. Lab exercises focus on basic well log interpretation, production forecasting via decline curve analysis (DCA), and deterministic and probabilistic reserves calculations. Students will learn to use state-of-the-art software programs to develop business-based decisions on reservoir development projects. The course outline/syllabus contains a detailed schedule including a list of specific topics. In addition to the PowerPoint-based lectures, you are also expected to read the assigned technical papers (mostly from the AAPG and SPE online accessible "libraries"). Any non-AAPG or SPE papers will be provided via D2L. There is no textbook for this class.

The Lab portion of the course includes hands-on projects ranging from constructing and interpreting cross sections, constructing and interpreting maps commonly used by petroleum geologists (e.g. structure, isopach, and reservoir property maps), deterministic and probabilistic volumetric calculations using Excel and @RISK software, well log interpretation for lithology, porosity, and saturation, Decline Curve Analysis (DCA), and Reserves Calculation and Reporting. **Note that all Labs will be introduced in person in Bolin 105 or during the normal lab time (Wednesday's 1-2:50pm)** *Graduate students will have additional requirements (e.g. longer research paper/more difficult topic, additional homework and lab exercises, and additional questions on exams).*

Required Textbook & Instructional Materials

No required textbook. Readings will be posted in D2L or available through the library via links (AAPG, SEG, and SPE online libraries) or readings posted in D2L.

Student Handbook

Refer to: <https://msutexas.edu/student-life/assets/files/handbook.pdf> or most recent MSUTexas Student Handbook

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 techniques of crediting, or the submission for credit of work not the individual's to whom credit is given). Additional guidelines on procedures in these matters may be found in the Office of Student Conduct and also in the student handbook.

Grading

Note: No homework, lab assignments, or research papers may be submitted after 5/1/2023. The Table below (next page) summarizes the grading policy for this course.

There will be three lecture exams, the first two will each determine 15% of your final grade and the third ("final") exam will determine 20% of your course grade. Note that all lecture exams are "cumulative and comprehensive"; all prior material covered in lecture and lab, textbook readings, and any assigned readings will be included on exams. The "lecture" portion of the course will account for 50% of your final course grade. The "lab" portion of your grade will account for a total 35% of your final course grade. The lab grade will be derived as follows: 85% based on assigned labs and 15% on homework assignments. Completion of all homework and lab assignments on time is expected. Given appropriate prior notice, labs may be made up within one week without penalty. Labs and homework submitted late may be subject to a lab exercise grade penalty as follows 10% for five days past due; 20% for one week past due; 30% for two weeks past due. After two weeks, a missed homework or lab assignment may be given a grade of zero. The lab and homework assignments will be posted in D2L. Finally, the Research Paper and Presentation (details in separate section below) accounts for the 15% of your final grade; each counts 50% towards the overall Research paper grade. An electronic (MSWord or pdf) version of your completed Research Paper is due per the syllabus schedule. The penalty for late submission of the research paper is as follows: 10% for five days past due; 20% for one week past due; 30% for two weeks past due; after two weeks a grade of zero may be recorded for the Research Paper grade. An electronic version (MS PowerPoint or pdf) is due per the syllabus schedule. The topic for your Research Paper is due per the syllabus schedule.

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	15%
Exam 2	15%
Final Exam (may be a "take home project" or traditional online Q&A style exam)	20%
Lab Grade (includes homework, lab exercises/reports, lab participation and attendance)	35% (total)
Research Paper and Presentation	15%

Table 2: Final grade determination (grades are normally 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 must be submitted via the appropriate and specific D2L drop box. Formats used must be compatible with D2L (**Apple proprietary formats such as “.heic” and “.pages” are not supported by D2L at this time**). Grade penalties for late submittal may be applied; see grading section for details. Homework may also be submitted in hardcopy format (drop off in Dr. Meddaugh’s mailbox in Bolin 307).

Lab Assignments

See Grading Section for details – All Lab Assignments must be submitted via the appropriate and specific D2L drop box. Formats used must be compatible with D2L (Apple proprietary formats such as “.heic” and “.pages” are not supported by D2L at this time). Grade penalties for late submittal may be applied; see grading section for details. Note that should the university lab used by this course (Bolin 105) be closed due to Covid-19 related issues or concerns, alternative lab assignments will be posted that will not make use of software that is only available on campus.

Research Paper and Presentation Requirements

Research paper and presentation composite grade is 15% of final course grade. Research papers must be between 4000 and 5000 words (about 8-10 pages of text based on 11-pt or 12-pt font; word count per MSWord’s word count tool) and be no longer than 20 total pages including illustrations and title page. Figures and/or tables (with captions) may be included within text or at end of the paper (proper credit must be given for figures, maps, pictures that you include in your report that you have not “created”). Format for the report is MS Word or pdf file. The digital copy to be submitted per the course schedule/syllabus. Your paper must be organized as follows:

1. **Title and author name on front page.** Nothing else on the front-page, please!
2. **Abstract** – 250 word limit summarizing your paper including a sentence on why you chose the particular topic

3. **Introduction** – Opening paragraphs of your paper that describe the topic in general, its importance or application to you and the community, and why you choose the particular topic
4. **Main Body** – Discussion of what your research revealed to you and what you want to share with the reader
5. **Conclusion(s)** – the key message or “take-away” points that you expect the reader to remember
6. **References** – list of references you used to research and write your paper; minimum number of primary peer-reviewed (journal) references is five.

Failure to follow the organizational and heading structure given above is an automatic 20% grade deduction! Failure to meet/exceed the length requirement may result in additional 10% grade deduction. Failure to properly cite your sources in the paper or presentation may result in a 10% grade reduction - please make sure that for any map, picture, graph or other illustration that you included in your paper has the source/reference in the caption. Presentations will be completed using PowerPoint. In addition to the “normal” PowerPoint file a narrated PowerPoint file must also be submitted as there will may be no opportunity to have in-person presentations. Papers and presentations are due as per the syllabus schedule. See the Late Submission Penalties section for information on late submittals. Research papers and presentations submitted more than one week late may be given a grade of zero. Note: No work may be submitted after 4/30/2023. All Research Papers must be submitted in Microsoft Word or PDF format. Presentations to be submitted in MS PowerPoint Format (normal, and narrated). Presentations must follow any posted format “guidelines” in D2L (course information folder). You will have 20 minutes for your Presentation which may be given as voice-over PowerPoint or a “live” via Zoom meeting. You may be asked questions (either from Dr. Meddaugh or classmates) and your answers will count towards your overall Research Paper grade. Your Presentation file must be submitted to the Research Paper D2L Dropbox. Large files for D2L may need to be submitted in parts.

All research paper topics must be approved in advance. All presentations must follow SPE Guidelines provided in D2L.

Note that Graduate student research papers and presentations are expected to be about 50% longer than undergraduate student research papers but no more than 100% longer.

Extra Credit

There are no Extra Credit opportunities in this course.

Class and Lab Attendance Policy – Important!

As this course is being presented essentially online, students should follow the syllabus schedule or work-ahead. Any changes will be announced in advance via D2L news.

Exams

See Grading Section for details. All in-class exams will have a time limit of 55 minutes for the first two Exams and 110 minutes for the Final Exam (an **alternative Final Exam “project” may be substituted for a “classic test” final**). Any “take home exam/project” will have significantly longer time for completion. This will be announced in class and posted in D2L. Exam format is variable and may include true/false questions, multiple-choice questions, and short answer/problem questions on in-class exams or “large” problems on “take-home” exams. Students needing extra time for exams must supply a note from DSS. Late completion penalties for exams may be as much as one letter grade per day late. All exams are administered through D2L and open/close time will be given in the syllabus.

Late Submission Penalties

Late work will be accepted through 5/6/2024. However, the following penalties will apply in all cases of late submittals: 10% for one week past due; 25% for two weeks past due; 50% for three weeks past due; after three weeks a grade of zero may be recorded.

Important Dates

Last Day to drop with a grade of “W:” 4pm, April 24, 2024.

Refer to: [Drops, Withdrawals & Void](#)

Desire-to-Learn (D2L)

Extensive use of the MSU D2L program is a part of this course. Each student is expected to be familiar with this program as it provides a primary source of communication regarding assignments, examination materials, and general course information. You can log into [D2L](#) through the MSU Homepage. If you experience difficulties, please contact the D2L support group.

Online Computer Requirements

Taking a course with possible considerable online content requires you to have access to a computer with reasonable Internet access to complete and upload your assignments. 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! There are many places to access your class! Our online classes can be accessed from any computer in the

world which is connected to the internet. 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 however they are able to help you get connected to our online services. For help, log into [D2L](#).

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. Two formulas (federal and state) exist in determining the amount of the refund. Examples of each refund calculation will be made available upon request from the Registrar.

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, Midwestern State University 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 the university. 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 Midwestern State 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 [Undergraduate Catalog](#)

Notice

Changes in the course syllabus, procedure, assignments, and schedule may be made at the discretion of the instructor. Changes will be communicated to all students through D2L. Please check the course D2L news on a regular basis for schedule updates.

Course Schedule

Course schedule detail is given on the next several pages. The first table lists lecture topics, research paper due date, and scheduled exams (open/close times to be posted in D2L). The second table lists the due dates for the lecture homework assignments, lab assignments, and research paper/presentation. Labs are normally due one week after assignment. Exceptions and/or updates will be posted in D2L. Check the D2L news daily for updates. **Changes in the course syllabus, procedure, assignments, and schedule may be made at the discretion of the instructor anytime during the semester. Changes will be communicated to all students through D2L. Please check the course D2L news on a regular basis for schedule updates.**

Course Schedule – Lecture Topics and Exams

Date	Topic and Topic Number	Readings - TBA
17-Jan	Introduction to Petroleum Geology, Reservoir Engineering and the Petroleum System Approach	
19-Jan	Introduction to Petroleum Geology, Reservoir Engineering and the Petroleum System Approach	
22-Jan	Introduction to Petroleum Geology, Reservoir Engineering and the Petroleum System Approach	
24-Jan	Introduction to Sedimentology	
26-Jan	Introduction to Sedimentology	
29-Jan	Eolian Depositional Environment and Reservoir Examples	
2-Feb	Fluvial Depositional Environment and Reservoir Examples	
5-Feb	Fluvial Depositional Environment and Reservoir Examples	
7-Feb	Deltaic Environment and Reservoir Examples	
9-Feb	Non-Deltaic and Turbidite (Deep Water) Environment and Reservoir Examples	
12-Feb	Non-Deltaic and Turbidite (Deep Water) Environment and Reservoir Examples	
14-Feb	Carbonate Reef and Buildup Environment and Reservoir Examples	
16-Feb	Carbonate Reef and Buildup Environment and Reservoir Examples	
19-Feb	Naturally Fractured Reservoirs 1	
21-Feb	Naturally Fractured Reservoirs 2	
23-Feb	Review 1	
26-Feb	FIRST EXAM (will cover all material through February 21) - 15% of grade. The Exam will be provided/completed online. The online exam open/close time TBA.	
28-Feb	Formation Evaluation - Part 1	

Course Schedule – Lecture Topics and Exams

Date	Topic and Topic Number	Readings - TBA
1-Mar	Formation Evaluation - Part 2	
4-Mar	Formation Evaluation - Part 3	
6-Mar	Formation Evaluation - Part 4	
8-Mar	Formation Evaluation - Part 5	
11-16 Mar	SPRING BREAK - NO CLASS	
18-Mar	Petroleum Reservoir Characterization – Core Data	
20-Mar	Unconventional Oil and Gas–Part 1	
22-Mar	Unconventional Oil and Gas–Part 2	
25-Mar	Unconventional Oil and Gas–Part 3	
27-Mar	Exam 2 – Details to be Announced (will cover all material presented or assigned through March 25) - 15% of grade. Exam open/close time TBA.	
29-Mar	Reservoir Development, Engineering, Reserves and Commerciality - Part 1	
1-Apr	Reservoir Development, Engineering, Reserves and Commerciality - Part 2	
3-Apr	Reservoir Development, Engineering, Reserves and Commerciality - Part 3	
5-Apr	Uncertainty Part 1 – Univariate and Bivariate Statistics	
8-Apr	Uncertainty Part 2 – Assessment and Calculation	
10-Apr	Introduction to Geostatistics – Spatial Statistics and Estimation Part 1	
12-Apr	Introduction to Geostatistics – Spatial Statistics and Estimation Part 2	
15 Apr	Introduction to Geostatistical Reservoir Modeling 1	
17-Apr	No Class	
19-Apr	Introduction to Geostatistical Reservoir Modeling 2	
22-Apr	Reservoir Case History with Volumetric Lookback	
24-Apr	Data Mining Last Day to Drop Course with a “W” is April 24	
26-Apr	Reservoir Surveillance 1	
29-Apr	Reservoir Surveillance 2	
1-May	CCUS for Geologists and Engineers – Introduction	

Date	Topic and Topic Number	Readings - TBA
3-May	CCUS for Geologists and Engineers – Part 3	
6-May	Applied Petroleum Geology Final Exam (Exam 3) or Final Project Due at 5pm	

Lab and Homework Schedule on Next Page

Homework Schedule is a function of the lecture schedule and as such will be assigned during lectures. Required reading will also be assigned as a function of the lecture schedule and will be assigned during lectures and/or labs. All homework and required reading assignments will be posted in D2L news as well (along with due dates for homework). Readings may be provided in the Required Reading folder in D2L or by way of MSU Library links to the AAPG DataPages, SPE OnePetro, and SEG libraries during lectures. ***Note that Graduate students will have significant additional required readings. Graduate students will have additional homework problems as well as additional lab components to complete and additional Research Paper/Presentation length.***

Course Schedule –Due Dates for Labs, Homework, Research Paper, and Assessments by Week. Assignments are due in the appropriate D2L Dropbox by 11pm of the Dates listed below.

Date	Lab Assignment Due Dates	Homework (HW) Due Dates
1/18/2023	No lab	None
1/25/2023	Lab A: Excel – Your Retirement Plan	HW 1
3/1/2023	Lab B: Introduction to Contour Mapping	HW 2
2/4/2023	Lab C: Introduction to Well Log Correlation and Simple Cross Sections	HW 3
2/11/2023	Lab D: Well Log Correlation and Mapping	HW 4
2/18/2023	Lab D: Well Log Correlation and Mapping (continued) and Lab E: Map-based Volumetrics 1	HW 5
2/25/2023	Lab F: Map-based Volumetrics 2	HW 6
3/4/2023	Lab G: Lithology from Well Logs; Lab H: Porosity and Lithology from Well Logs	HW 7
3/11/2023	Lab H: Porosity and Lithology from Well Logs (continued)	HW 8
3/18/2023	No Lab Due	None
3/25/2023	Lab I: Deterministic OOIP Exercise	HW 9
4/5/2023	Lab J: Probabilistic OOIP Project	HW 10
4/12/2023	Lab K: Reserves or Production Project	HW 11
4/19/2023	Student Reservoir Geology or Engineering Case History Presentations during Lab.	Research Paper Due by Noon
4/26/2023	Final Lab Project Due	None
5/3/2023	Last Day to Submit Any Late Assignments for Partial Credit by 11pm. Grade penalties per the course syllabus may apply.	

End of course syllabus