

# **Course Syllabus: Introduction to Ore Deposits and Energy Resources**

McCoy College of Science, Mathematics, and Engineering

GEOS 4533

Fall 2019

## **Contact Information**

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Office: Bolin 307F

Office hours: Monday-Thursday 11am-noon; 3-4pm. Full class schedule in D2L.

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## **Course Description**

A Lecture and Lab-based introduction to the geology and exploitation of metallic, industrial, and energy deposits. Lectures, by their very nature are of limited length and cover the most essential aspects of the geology, exploration, and exploitation of metallic and non-metallic mineral deposits as well as conventional and unconventional (aka basin-centered) oil and natural gas resources.

In addition to the PowerPoint-based lectures, you are also expected to read the appropriate chapters in the required course textbook as well as assigned readings that are posted in D2L. This course outline/syllabus contains a detailed schedule including a list of specific topics and corresponding textbook readings. Homework exercises that focus on aspects of lectures and/or assigned readings will be provided during the semester.

The Lab portion of the course includes hands-on projects ranging from ore mineral and rock identification to constructing 2D (maps and cross sections) and 3D (volume) descriptions of ore deposits and/or exploration projects. The latter will include generating 2D contour maps and/or 3D volumes representing the distribution of ore values based on surface, drillhole (core), or other appropriate data. You will use "traditional" mapping techniques along with Excel-based tools to evaluate a potential ore deposits and determine within a probabilistic framework the likelihood that the deposit will be economic.

At the end of this course, you will be familiar with the types of ore and energy deposits associated with specific geological settings including igneous, metamorphic, and sedimentary environments. Approximately 80% of the course is devoted to metallic and non-metallic mineral deposits and 20% devoted to energy resources (mainly oil and gas).

## **Required Textbook**

*Ore Deposit Geology* (John Ridley). There will also be significant assigned readings including journal papers as well as UGSG and other governmental

agency reports. The non-textbook material will be available online or provided in D2L.

### **Student Handbook**

Refer to: [Student Handbook 2017-18](#) or current

### **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. See Student Handbook

### **Grading**

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 each 24 hours past due. After one week, 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 each 24 hours past due; after one week a grade of zero may be recorded for the Research Paper grade. An electronic version (MS PowerPoint or pdf) and paper copy is due per the syllabus schedule. The topic for your Research Paper is due per the syllabus schedule. Failure to submit both the electronic copy and paper copy may incur a 20% grade penalty in addition to any late penalties. The research paper grade is determined based on format compliance (may be up to 50% of paper grade; see previous paragraph for details) and content/logical reasoning (may be up to 50% of paper grade). The homework and lab assignments will be posted in D2L. The homework assignments will include questions to answer that focus on lecture and lab content. Additional reading and or research may be required to complete homework assignments. Homework due dates are listed in the syllabus. 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, Exam 2	15% each
Exam 3 (Final Exam)	20%
Lab Grade (includes lab assignments and homework assignments)	35% total
Research Paper and Presentation	15% total (2/3 based on paper and 1/3 based on presentation)

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 89.4% 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. Homework assignments will be posted in D2L.

### Lab Assignments

See Grading Section for details. Lab assignments will be posted in D2L

### Lab and Lecture Attendance Policy – Important!

Students who miss three or more lectures or two 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 Dr. Meddaugh by email in advance of missing a lab section. Students who leave lab sections early may be marked absent. **Excessive lab absences (more than two unexcused absences) may result in your being dropped from the course.**

### Exams

See Grading Section for details – Three lecture exams are included in your course grade; see the Grades Section above for details. All exams will have a time limit of 50 minutes for the 2 “midterm” exams and 110 minutes for a

“classic” final exam, if given. Note that the actual final exam may be a Typical exam given during the last week of the semester (in which case, only 50 minutes will be allocated for completion) or a combination final lab and “take-home” exam provided during the final week of the semester and require significantly more effort than the 110 minutes for a “classic” final lecture hall-type exam. Exam grades may be curved/adjusted if appropriate.

### **Research Paper**

Research Paper topics must be selected from the list provided in the appropriately named folder in D2L. Topics are first come, first served (email your topic choice to Dr. Meddaugh). The D2L folder contains one reference for each topic on the list. See Grading Section for details about content and format. All Research Papers must be submitted in Microsoft Word or PDF format to Dr. Meddaugh at [scott.meddaugh@msutexas.edu](mailto:scott.meddaugh@msutexas.edu) and paper copy via Dr. Meddaugh’s physical mailbox in Bolin 307. Failure to submit both the electronic copy and paper copy may result in a significant grade penalty.

### **Extra Credit**

There are no extra credit opportunities in this course.

### **Late Work**

Late work will be accepted through 12/6/2019. However, penalties will apply in all cases of late submittals per the grade section of this syllabus. No course assignments will be accepted after 12/6/2019.

### **Important Dates**

Last Day to drop this course with a grade of “W” is 4pm, October 28, 2019  
Refer to: [Drops, Withdrawals & Void](#)

### **Desire-to-Learn (D2L)**

The MSU D2L program is a part of this course. Lectures, review materials, and course information is 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.

### **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, 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 WATC. 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 (including grading policy), 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 news on a regular basis for schedule updates.

Course schedule detail given on the next several pages. The first table lists lecture topics, textbook readings, and the three lecture exams. Additional assigned readings will be announced in D2L during the semester. The second table lists the dates for the lab topics and the research paper due date. Homework due dates will be announced in lecture and in D2L. All lab, homework, and assigned readings will either be posted in D2L or links provided. Course Schedule follows on next four pages.

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

Date	Topic and Topic Number	Textbook Chapter or Pages
26-Aug	Topic 1 – Course Introduction	None
28-Aug	Topic 2 – Introduction to Petroleum Geology	None
30-Aug	Topic 2 – Continued; Topic 3 Petroleum Reservoir Characterization including Well Logs	None
2-Sep	Topic 3 - Petroleum Reservoir Characterization including Well Logs	None
4-Sep	Topic 4 – Unconventional Oil and Gas Reservoirs	None
6-Sep	Topic 4 – Continued; Unconventional Oil and Gas Reservoirs	None
9-Sep	Topic 5 - Introduction to Some Important Terms and Concepts (Ore Deposits)	None
11-Sep	Topic 5 – Continued; Introduction to Some Important Terms and Concepts (Ore Deposits)	Chapter 1
13-Sep	Topic 5 – Continued; Introduction to Some Important Terms and Concepts (Ore Deposits)	Chapter 1
16-Sep	Topic 6 – Magmatic Ore Deposits Introduction	Chapter 2
18-Sep	Topic 7 - Deposits Formed from Small-Fraction Partial Melts - LREE Carbonatites	Chapter 2
20-Sep	Topic 8 – Deposits Formed During Differentiation of a Silicate Melt - Chromite Deposits	Chapter 2
23-Sep	Topic 9 -Sulfide Immiscible Formation of Base Metal Copper Nickel Deposits	Chapter 2
25-Sep	Topic 10 - Sulfide Immiscible Formation of PGE Deposits	Chapter 2
27-Sep	Topic 10 – Continued; Sulfide Immiscible Formation of PGE Deposits	Chapter 2

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

Date	Topic and Topic Number	Textbook Pages
30-Sep	<b>No class – lecture may be provided in D2L</b>	
2-Oct	<b>No class – lecture may be provided in D2L</b>	
4-Oct	Review	None
7-Oct	<b>FIRST EXAM</b> (will cover all material through October 2) - 15% of grade	None
9-Oct	Topic 11 - Pegmatite Deposits	Chapter 2
11-Oct	Topic 12 - Kimberlite Deposits	
14-Oct	Topic 12 - Porphyry Deposits	Chapter 3
16-Oct	Topic 13 - Introduction to Hydrothermal Deposits	Chapter 3
18-Oct	Topic 14 - Porphyry Deposits	Chapter 3
21-Oct	Topic 14 - Continued; Porphyry Deposits and Topic 15 Greisen Deposits	Chapter 3
23-Oct	Topic 15 - Continued; Review	Chapter 3
25-Oct	<b>SECOND EXAM</b> (will cover all material presented or assigned through October 23) - 20% of grade	None
28-Oct	Topic 16 - Skarns and Carbonate Replacement Deposits	Chapter 3; <b>Last Day to Withdraw with a "W"</b>
30-Oct	Topic 17 - Polymetallic Vein and Epithermal Vein Deposits	Chapter 3
1-Nov	Topic 18 - Volcanic Hosted Massive Sulfide Deposits	Chapter 3
4-Nov	Topic 19 - Hydrothermal Deposits Without Close Tie to Magmatism	Chapter 3
6-Nov	Topic 20 - Base Metal and Uranium Deposits in Sedimentary Rocks	Chapter 4
8-Nov	Topic 20 - Continued; Base Metal and Uranium Deposits in Sedimentary Rocks	Chapter 4
11-Nov	Topic 21 - Other Ore Deposits in Sedimentary Rocks and Sediments	Chapter 5



Date	Topic and Topic Number	Textbook Pages
13-Nov	Topic 21 – Continued; Other Ore Deposits in Sedimentary Rocks and Sediments	Chapter 5
15-Nov	Topic 21 – Supergene Ores	Chapter 6 (note that this topic will also be covered in several of the labs)
18-Nov	Topic 22 – Geophysical Exploration	TBA
20-Nov	Topic 22 – Continued; Geophysical Exploration	TBA
22-Nov	Student Presentations	
25-Nov	Student Presentations	
27-Nov	<b>No Class - Thanksgiving</b>	
29-Nov	Student Presentations	
2-Dec	Student Presentations	
4-Dec	Review and/or Student Presentations	
6-Dec	<b>THIRD EXAM</b> (will cover all material presented in the lecture and the lab section of the course) - 20% of grade. Note that in lieu of the Third Exam on Friday, December 6 it may be scheduled for December 9 instead	
9-Dec	Grades Available (Note: Alternative date for Exam 3 per syllabus text; TBA)	

**Course Schedule – for Labs and Homework Assignments, and the Research Paper (Page 1 of 1)**

Date	Lab Topic, <b>Research Paper Topic and Paper Due Date</b>	Homework Assignments (TBA)
28-Aug	Lab 1: Retirement Plan – Excel Exercise	
4-Sep	Lab 2: Contour Mapping	
11-Sep	Lab 3: Well Log Interpretation (introduction)	
18-Sep	Lab 4: Well Log Correlation and Cross Sections	
25-Sep	Lab 5: Map-based Volumetrics	
2-Oct	<b>No Lab Meeting.</b> Continue working on Lab 5.	
9-Oct	Lab 6: Metallic Ore Mineral Identification Part 1 – Hand Sample	
16-Oct	Lab 7: Metallic Ore Mineral Identification Part 2 – Hand Sample and Supergene Enrichment	
23-Oct	Lab 8: Metallic Ore Mineral Identification Part 3 – Reflected Light Microscopy	
30-Oct	Lab 9: Ore Deposit Evaluation with Uncertainty	<b>Research Paper Topic Due by 4pm October 28 (email to Dr. Meddaugh); may be submitted any time before the deadline. Allowed topics are in D2L; first come, first served.</b>
6-Nov	Lab 10: Project Economics and Time Value of Money	
13-Nov	Lab 11: Project Evaluation and Mining Economics	<b>Reminder - Research Paper and Presentation Files/Paper Copy Due by 4pm November 18; Presentations begin November 22</b>

Date	Lab Topic, <b>Research Paper Topic and Paper Due Date</b>	Homework Assignments (TBA)
20-Nov	Lab 12: Project Evaluation and Mining Economics (continued)	
27-Nov	No Lab – Thanksgiving Break	
4-Dec	<b>TBA</b>	

End of course syllabus