

OIL AND GAS GEOLOGY/GEY-127-601

Spring 2018 Syllabus

April 21 & April 28

CONTACT INFORMATION

Instructor: Jason Eleson

Office: NA

Office Hours: If you need extra help outside of class, please email me so that we can have a conversation over the phone or set up a time to meet on campus.

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REQUIRED TEXTBOOK/COURSE MATERIALS

No textbooks required; printouts of lectures will be supplied to class, and are also available on D2L

COURSE DESCRIPTION:

Introduces basic concepts of oil and gas geology including associated rock types, hydrocarbon formation mechanisms, stratigraphic relationships, permeability, and various types of “traps”. Oil and gas exploration and production methods are also covered. Examples from within Colorado are given.

Credit hours: 1 credit hour

COURSE PREREQUISITE/CO-REQUISITES

Physical Geology course suggested, but not required

COURSE LEARNING OUTCOMES

STANDARD COMPETENCIES:

1. Discuss how coal, shale, and sandstone are formed.
2. Recognize and classify shale, sandstone, and coal and explain how each of these rock types is utilized in the oil and gas industry.
3. Describe oil and gas in the context of sedimentary basin formation and burial history.
4. Explain and identify oil and gas stratigraphic and structural ‘traps’ in the subsurface.
5. Identify on a map the major sedimentary basins within the lower 48 United States.
6. Identify on a map the major sedimentary basins associated with oil and gas production in Colorado.
7. Describe basic exploration practices used to find oil and gas.
8. Describe basic drilling practices used to extract oil and gas.
9. Explain how oil and gas wells are drilled according to the surface grid method: Township and Range coordinates.

10. Identify the location of at least one oil and gas area in Colorado in the field and/or on a geologic map.
11. Explain the geology and production of at least one oil and gas area in Colorado (e.g. Denver Basin).

TOPICAL OUTLINE:

I. Introduction to rocks

- a. Definition of minerals
- b. Definition of rocks
- c. The rock cycle
- d. Identification of sedimentary rocks

II. Coal

- a. Formation
- b. Identification
- c. Relation to oil and gas

III. Sandstone and shale

- a. Formation
- b. Identification
- c. Relation to oil and gas

IV. Sedimentary basins

- a. Hydrocarbon formation mechanisms
- b. Regression and transgression
- c. Basin formation (sedimentary rocks, structural events that form basins)
- d. Porosity and permeability
- e. Stratigraphic and structural "traps"
- f. Sequence stratigraphy
- g. Major sedimentary basins in the United States
- h. Major sedimentary basins associated with oil and gas in Colorado

V. Oil and gas production

- a. Business structure of an operation company
- b. Techniques used to locate oil and gas
- c. Basic drilling techniques
- d. Contour mapping
- e. Well logs
- f. Surface grid method: Township & Range coordinates

VI. Oil and gas area(s) in Colorado: case study

- a. Source, reservoir, and seal rock units
- b. Geologic basin history/development through time
- c. Mineral and surface rights
- d. Drill spacing using Township & Range coordinates
- e. Overview of drilling operations

COURSE REQUIREMENTS / EXPECTATIONS

This class is intended to give a general overview of oil and gas geology, and instruction is given through a combination of 1) in-class lectures and student activities/exams, 2) a field trip to visit an outcrop that show rocks that exemplify subsurface drilling targets OR a field trip to an active drill rig on the second Saturday (4/28), and 3) a take home project that will be given on Saturday (4/21) and is due on Saturday (4/28) at 9 pm. The course focuses on both the geologic events that allow oil and gas to be created and trapped in the subsurface, as well as modern exploration and production technologies that allow that gas to be identified, drilled, and produced. It is expected that students will show up for all lectures and field stops, participate in lab work, writing assignments and quizzes. It is also expected that students will give written answers on exams, labs and writing assignments that are coherent, cogent and free of typographic and grammatical errors.

GRADING POLICY

Grades will be determined based on Attendance and Participation (20%), In-class labs (20%), In-class exams (30%) and a research project that will be completed outside of class (30%).

METHODS OF EVALUATION / GRADING / ASSESSMENT

Quizzes, labs, attendance, participation & a research project will be used to determine grades. See below for details.

GRADING SCALE

A letter grade will be assigned to the following scale; 90-100%=A, 80-89%=B, 70-79%=C, 60-69%=D, <59%=F. Incomplete grades will not be given. Extra credit is not available for this course and there will be no grading "on the curve".

CRITERIA FOR GRADING / GRADING STANDARDS / ASSESSMENT MODULES

Attendance & Participation: You must be present for the entire class to receive full credit. If you are late and miss an assignment you may not copy someone else's work for credit. For every hour of attendance or participation, 1% will be added to the final grade. If more than 5 cumulative hours are missed, then a failing grade will automatically be given with no chance to make up what was missed.

Class Activities: There will be in-class activities on each class day that will be done on both an individual and group basis. Also, there will be a group activity during the field trip. Notes will be made as to which students are or are not actively engaged in the group labs, and will be reflected in the Attendance and Participation score.

Exams: There will be 2 open-note exams, one exam given at the end of each Saturday class period.

Research Project: You will have 1 week to complete a 3-page typed essay (size 12 font, single spaced), not including the references and figures section. This essay must be loaded on the D2L site by Saturday, April 28,

2018 at 9pm MST in order to receive credit. NO LATE RESEARCH PROJECTS WILL BE ACCEPTED! You will be required to choose 1 topic from subset of topics that will be offered during class. Plagiarism won't be tolerated, and will be checked for when I am grading your papers. It is OK cite specific data or comments from a given source, provided that 1) verbatim comments from external sourced are included in quotation marks or italics to identify that these are not your own words, 2) the source of these comments are provided in a bibliography or references section and 3) that the verbatim verbiage is not longer than 2 sentences AND make up less than 10% of the essay. Points will be awarded based on depth of investigation, ability to descriptive yet concise, critical thinking, references and citations. More detail as described below:

- ❑ *Clarity and Organization (30%): This includes the proper ordering of topics presented in the research paper (Introduction, Body of Report, Conclusions, References Section, Figures Section), as well as coherent arguments, proper use of grammar and punctuation, use of figures to illustrate key points. If I can't figure out the point you are trying to make, I cannot give you a high score!*
- ❑ *Depth of Investigation (30%): Illustrate that original topic has been investigated in sufficient detail to arrive a meaningful conclusion. May include discussing other relevant facts or issues discovered while investigating topic, which are succinctly incorporated into the research report*
- ❑ *Quality of Research (30%): Ability to perform research to address key topics, without relying 100% on internet sites like wikipedia! Books, journals, and periodicals can be accessed from the internet (many of them for free!), and personal interviews from subject matter experts are all viable references. Variety of sources is key...using one or two websites will guarantee a low score for quality of research*
- ❑ *Overall effectiveness of paper (10%): Summation of aforementioned criteria. Ability of paper to persuade and inform others on the topic of interest. COURSE POLICIES*

IMPORTANT DATES

STUDENTS: PLEASE VERIFY THE SPECIFIC DROP AND WITHDRAW DATES FOR THIS COURSE IN YOUR “[Detailed Student Schedule \(with Drop-Withdrawal Dates\)](https://erpdnssb.cccs.edu/PRODRRCC/wt_student_sched.P_DisplayStudentSched)” LINK IN THE ROCK, UNDER THE STUDENT TAB
(https://erpdnssb.cccs.edu/PRODRRCC/wt_student_sched.P_DisplayStudentSched)

DROP/CENSUS DATE (LAST DAY TO DROP WITH A REFUND)

This is the last day you can remove yourself from this class without having to pay for the class and without the class showing on your permanent student record. If you are on financial aid, you should consult a financial aid advisor before dropping a class. All students are encouraged to see an academic advisor about how dropping may affect their goals.

WITHDRAW DATE (LAST DAY TO WITHDRAW WITH A “W”)

This is the last day you can remove yourself from this class and receive a “W” for the class instead of a grade. You are responsible for payment. If you are on financial aid, you should consult a financial aid advisor before withdrawing from a class. All students are encouraged to see an academic advisor about how withdrawing may affect their goals.

ATTENDANCE POLICY

Attendance at all class or field trip sessions is required.

MAKE-UP / LATE WORK POLICIES / EXTRA CREDIT

No make up work will be allowed. No late work will be accepted. No extra credit will be given.

ACADEMIC INTEGRITY STATEMENT / ACADEMIC DISHONESTY

Students at RRCC are expected to adhere to the policies for academic integrity and the student conduct code described in the Student Handbook. All students in this class will sign a pledge to be on their honor to do their own work and to follow these policies. There is a zero tolerance policy for any form of academic dishonesty in this course. Disciplinary action will be taken against any student found guilty of academic dishonesty such as cheating or plagiarism. All written work you prepare **MUST** be your own. If your words match those of others, I will assume you copied rather than thinking about the answers yourself. The penalty for being dishonest in this way is far greater than simply getting a wrong answer. If you are unclear whether or not your actions are acceptable, please ask in advance. Any student guilty of any form of academic dishonesty will receive a grade of ZERO for that assignment or exam and will be subject to additional disciplinary action, up to and including failing the course and/or being expelled from the college.

CLASS CANCELLATION POLICY

Outdoor field work will be determined by weather the day of the field trip. If inclement weather is approaching, I will use your RRCC emails and/or D2L to communicate if class trips will be cancelled. If RRCC cancels classes for either classroom day for any reason, we will identify an alternative time/date to make up that portion of class.

RRCC SYLLABUS INSERT – REQUIRED AND ADDITIONAL INFORMATION

All students are required to be familiar with the information contained in the RRCC Syllabus Insert document. In addition to your instructor reviewing the required content in class, the RRCC SYLLABUS INSERT can be found as an announcement on all D2L landing pages (where you have access to all of your courses) and in the “Student Resources” pull-down menu.

TENTATIVE COURSE SCHEDULE

WEEK 1 – SATURDAY, APRIL 21

- Sedimentary Basins: What they are, how they form, and why we care.
- Hydrocarbon System Play Elements: What it takes to make an oil/gas field.
- Reservoir and Source Rocks: Sandstones, Limestones, Shales & Coals
- Class Activity
- *Lunch break (on your own)*
- Trap and Seals, Hydrocarbon Maturation and Migration
- Oil and Gas Exploration Methods
- Class Activity
- Exploration Mapping Techniques
- Class Activity
- Individual Open-Note Exam #1

WEEK 2 – SATURDAY, APRIL 28

- 9:00am: Arrive at Niobrara Outcrop Exposure (directions to outcrop will be provided at the end of the first class on Saturday, April 21). If you don't show up on time, you will lose credit based on your tardiness per the attendance and participation guidelines. **Closed-toed shoes only! No open toed shoes allowed on the outcrop!**
- Short Lecture, Class Lab, Group Discussion
- *Lunch break (on your own)*
- Drive to campus

- Oil and Gas Extraction Techniques in Conventional and Unconventional Reservoirs
- Summary Discussion, Question and Answer Period, Course Evaluation
- Individual Open-Note Exam #2

Important Field Trip Information: This course includes a field trip to outcrop near Boulder, CO. All students must sign a “Student waiver of liability form” prior to the trip. Students are responsible for providing their own transportation to and from the field trip locations (directions will be provided). Carpooling is strongly encouraged. Students should bring a lunch, snacks, water, and sunscreen and/or hat. Proper attire includes comfortable clothes for walking and short hikes, and close-toed shoes with good tread. Depending on the forecast students may also want to bring a rain jacket or umbrella. No guests will be permitted on the field trip. Additional details, including meeting location and time, will be discussed in class.”