Petroleum Geology and Fossil Fuels  
GEOL4032  
Fall 2021

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Department: Geology  
Office Hours: MW 9:00 am – 11:00 am; TTh 8:30 am – 10:00 am; By Apt. All office hours are via zoom and in person.  
Time: Lecture M 1:30 pm – 3:10 pm Room 323  
Lab M 3:30 pm – 6:00 pm Room 332 or otherwise told

Text and Materials  
4. Calculator  
5. Color pencils

Course Overview  
1. Two take home exams  
2. Weekly lab exercises are due the following week in lab  
3. Read your SFASU email  
4. Live streamed and F2F

Introduction to Petroleum Geology and Fossils Fuels will provide a foundation in Petroleum geology and Coal geology. We will explore a brief history of petroleum exploration, how hydrocarbons are preserved and generated in a variety of sedimentary environments, various pathways they may take during migration, and corresponding trapping mechanism. The course will review the various types of hydrocarbons (crude oil, propane, ethane, etc.), and students will learn their physical and chemical properties. We will overview exploration techniques including well drilling, wireline logging, and seismic interpretation. Unconventional hydrocarbon resources will also be studied. Finally, coal resources, methane clathrates, and other fossil fuels will be introduced.

You are expected to have read the material for the week outlined below, which will facilitate in content retention and aid in classroom discussions. I will also provide some supplemental material throughout the semester that is expected to be read before the designated class. These will consist of scientific research articles, excerpts from other books, and short course documents. There will be a combination of homework exercises and in-class exercises, along with periodically meeting in the computer lab to facilitate content.
Please limit food in the classroom, phone calls (silence phones), texting, and other distracting behaviors. If you need to leave, please do so quietly.

**COVID-19 MASK POLICY** Masks (cloth face coverings) are encouraged in the classroom. They are to be worn over the nose and mouth, and appropriate physical distancing is encouraged.

**Grading Policy**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>100-90%</td>
</tr>
<tr>
<td>B</td>
<td>89-80%</td>
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<tr>
<td>C</td>
<td>79-70%</td>
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<tr>
<td>D</td>
<td>69-60%</td>
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<tr>
<td>F</td>
<td>59-0%</td>
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</tbody>
</table>

*Tests (100 pts each)*

There will be two tests that will be taken home and turned back in a week later. Makeup tests can only be given in written documented exceptional situations.

*Labs (about 10-12 worth 25 pts each; 250-300 pts total)*

Lab runs the full period. There will be between 7-9 labs, each worth 40 points unless otherwise designated. You will need a calculator and colored pencils for lab regularly. Labs will be due the following week in lab. We will use both 323 and 332 (computer lab) as needed. The labs are meant to be hands-on where we will be using common techniques to explore the subsurface. These labs also will be using common computer programs.

**Attendance Policy**

Attendance is mandatory, and necessary in order to succeed in class. In-class assignments can only be made up with an excused and documented absence. Homework assignments need to be turned in on their due date, and will have 10% deducted for every day late. After 5 days late, they will no longer be accepted. To make-up an exam, only excused absences will be accepted (doctor’s note, sporting event, etc., with proper documentation). We will arrange a time and place for the make-up exam, which will be a different exam than the one given in class.
<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>Reading for Current Class</th>
<th>Lab</th>
<th>Topic</th>
<th>Assignments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>23-Aug</td>
<td>Introduction to Petroleum Geology + Drilling</td>
<td>Selley 1 &amp; 4; or KB 1</td>
<td>1</td>
<td>100 petroleum products</td>
<td></td>
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<tr>
<td>2</td>
<td>30-Aug</td>
<td>Petroleum Geochem</td>
<td>KB 14</td>
<td>2</td>
<td>Well Logging - GR, CAL</td>
<td></td>
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<tr>
<td>3</td>
<td>6-Sep</td>
<td>Petroleum Migration</td>
<td>KB 15</td>
<td>3</td>
<td>Well Logging - DEN, PE, NPHI</td>
<td></td>
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<tr>
<td>4</td>
<td>13-Sep</td>
<td>Subsurface Environment</td>
<td>Selley 5.1-5.3; KB 20</td>
<td>4</td>
<td>Well Logging - Resistivity, SP</td>
<td></td>
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<tr>
<td>5</td>
<td>20-Sep</td>
<td>Reservoirs</td>
<td>Selley 6</td>
<td>5</td>
<td>X-Section</td>
<td></td>
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<tr>
<td>6</td>
<td>27-Sep</td>
<td>Out of Town</td>
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<tr>
<td>7</td>
<td>4-Oct</td>
<td>Traps &amp; Seals</td>
<td>Selley 7 or KB 12</td>
<td>6</td>
<td>OpenDetect Lab 1</td>
<td></td>
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<tr>
<td>8</td>
<td>11-Oct</td>
<td>Basins</td>
<td>Selley 8</td>
<td>7</td>
<td>OpenDetect Lab 2</td>
<td></td>
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<tr>
<td>9</td>
<td>18-Oct</td>
<td>Non-conventional Resources</td>
<td>KB 21</td>
<td>8</td>
<td>OpenDetect Lab 3</td>
<td>Midterm</td>
</tr>
<tr>
<td>10</td>
<td>25-Oct</td>
<td>Carbon Capture and Storage</td>
<td>Bachu 2000</td>
<td>9</td>
<td>Geophysics of Coal and Log Interp</td>
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<tr>
<td>11</td>
<td>1-Nov</td>
<td>Coal - Origin, Age, Occurrence</td>
<td>Thomas 2 &amp; 3</td>
<td>10</td>
<td>Mapping and Understanding Depositional Patterns</td>
<td></td>
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<tr>
<td>12</td>
<td>8-Nov</td>
<td>Coal as a Substance</td>
<td>Thomas 4</td>
<td>11</td>
<td>TBD</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>15-Nov</td>
<td>Hydrogeology of Coal</td>
<td>Thomas 9</td>
<td>12</td>
<td>TBD</td>
<td></td>
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<tr>
<td>14</td>
<td>22-Nov</td>
<td>No Class</td>
<td></td>
<td></td>
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<tr>
<td>15</td>
<td>29-Nov</td>
<td>Coal as an alternative energy source, The envirionment</td>
<td>Thomas 11, 12</td>
<td>13</td>
<td>Final Paper Due Dec 5.</td>
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<tr>
<td>16</td>
<td>6-Dec</td>
<td></td>
<td></td>
<td></td>
<td>Finals Week</td>
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*Note that topics and date of topics are subject to change. I will try to keep you updated.*
**Course Description**
Two hours lecture plus 2.5 hour lab. An introduction to Fossil Fuels, with an emphasis on hydrocarbon generation and exploration techniques. Topics will include properties of hydrocarbons; preservation conditions and migration pathways; source rocks, reservoir rocks and trapping mechanisms; common exploration techniques such as wireline logging and seismic interpretation; and an overview on the preservation and exploration of other fossil fuels, such as coal, unconventional hydrocarbons, tar sands, and methane clathrates. 
Prerequisites: GOL 408 (sedimentology and stratigraphy)

**Credit Hour Justification**
The lecture GEOL 4332 (3 credits) meets for a minimum of 25 lecture contact hours during the semester, plus the final exam. The laboratory GEOL 4032 (0 credits) meets for 37.5 laboratory contact hours during the semester. The lecture and laboratory must be completed concurrently. The grades for lecture and laboratory are combined into one single grade for the course. Students are required to complete assignments based on selected readings, along with periodic quizzes, and exams over the course content, and a mandatory one-day field trip. Successful complete of all elements for the course (both lecture and laboratory) requires at least six hours of additional out-of-class work each week.

**Student Learning Outcomes**
After successful completion of this course students will be able to:
1. Identify different types of hydrocarbons, and describe their physical and chemical properties.
2. Use geologic methods to determine and identify hydrocarbon depositional environments.
3. Complete basic wireline logging interpretations of the subsurface using knowledge of rock formation properties and physics, and identify fluid types in the subsurface.
4. Identify different types of coal and their physical and chemical properties.
5. Determine the depositional environment and timing of coal preservation.

**Program Learning Outcomes**
PLO 1. Demonstrate mastery of fundamental core geologic concepts (e.g., Economic Geology, Engineering Geology, Geochemistry, Geomorphology, Hydrogeology, Mineralogy, Petrology, Stratigraphy, and Structural Geology).

PLO 2. Demonstrate mastery of geologic procedures and methods accurately, appropriately, and efficiently, including incorporation of technology.

PLO 3. Students will conduct, present, and defend scientific research to show mastery of geologic concepts.

PLO 4. Students will demonstrate mastery in effective oral and visual communication.

PLO 5. Students will demonstrate mastery in effective written communication.
Academic Integrity (4.1)
Academic integrity is a responsibility of all university faculty and students. Faculty members promote academic integrity in multiple ways including instruction on the components of academic honesty, as well as abiding by university policy on penalties for cheating and plagiarism.

Definition of Academic Dishonesty
Academic dishonesty includes both cheating and plagiarism. Cheating includes but is not limited to (1) using or attempting to use unauthorized materials to aid in achieving a better grade on a component of a class; (2) the falsification or invention of any information, including citations, on an assigned exercise; and/or (3) helping or attempting to help another in an act of cheating or plagiarism. Plagiarism is presenting the words or ideas of another person as if they were your own. Examples of plagiarism are (1) submitting an assignment as if it were one's own work when, in fact, it is at least partly the work of another; (2) submitting a work that has been purchased or otherwise obtained from an Internet source or another source; and (3) incorporating the words or ideas of an author into one's paper without giving the author due credit. Please read the complete policy at http://www.sfasu.edu/policies/4.1-student-academic-dishonesty.pdf.

Withheld Grades Semester Grades Policy 5.5)
Ordinarily, at the discretion of the instructor of record and with the approval of the academic chair/director, a grade of WH will be assigned only if the student cannot complete the course work because of unavoidable circumstances. Students must complete the work within one calendar year from the end of the semester in which they receive a WH, or the grade automatically becomes an F. If students register for the same course in future terms the WH will automatically become an F and will be counted as a repeated course for the purpose of computing the grade point average. For additional information, go to http://www.sfasu.edu/policies/course-grades-5.5.pdf.

Students with Disabilities
To obtain disability related accommodations, alternate formats and/or auxiliary aids, students with disabilities must contact the Office of Disability Services (ODS), Human Services Building, and Room 325, 468-3004 / 468-1004 (TDD) as early as possible in the semester. Once verified, ODS will notify the course instructor and outline the accommodation and/or auxiliary aids to be provided. Failure to request services in a timely manner may delay your accommodations. For additional information, go to http://www.sfasu.edu/disabilityservices/.

SFASU values students' mental health and the role it plays in academic and overall student success. SF A provides a variety of resources to support student's mental health and wellness. Many of these resources are free, and all of them are confidential.

On-campus Resources:
SF ASU Counseling Services
www.sfasu.edu/counselingservices
3rd Floor Rusk Building
936-468-2401

SFASU Human Services Counseling Clinic
www.sfasu.edu/humanservices/139.asp
Human Services Room 202
936-468-1041

Crisis Resources:
Burke 24-hour crisis line 1(800) 392-8343
Suicide Prevention Lifeline 1(800) 273-TALK (8255)
Crisis Text Line: Text HELLO to 741-741