Petroleum Geology and Fossil Fuels w/Lab
GEOL 5332 and 5032
Fall 2023

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Office: E.L. Miller Science Building, Rm 309
Department: Earth Sciences and Geologic Resources
Office Hours: T: 2:00 pm – 4:00 pm
W: 10:00 am – 12:00 pm
Th: 2:00 pm – 4:00 pm
Time: Lecture M 1:00 pm – 2:40 pm Room 330
Lab       M 3:00 pm – 5:30 pm Room 330 or 332

Text and Materials
3. Calculator
4. Color pencils

Course Overview
1. Two in-class exams, with additional questions from the UG
2. Weekly lab exercises are due the following week in lab
3. Periodic Assignments
4. Presentation at the end of the semester
5. Paper over the presentation at the end of the semester
6. Read your SFASU email
7. Check D2L regularly (turn on your notifications for new messages)
8. Field Trip – Sept 9th @ Noon to 7 pm

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 various sedimentary environments, various pathways they may take during migration, and the 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.
**Student Learning Outcomes**

After successful completion of this course, students will:

1. Understand petroleum as a natural resource and the societal and economic impact of hydrocarbons.
2. Have a basic understanding of petroleum systems, including source, reservoir, seal, maturation, and migration.
3. Detail depositional conditions and environments which can produce hydrocarbon source, reservoir, and seal rocks.
4. Understand petroleum traps, their occurrence, and identification.
5. Complete basic wireline logging interpretations of the subsurface using knowledge of rock formation properties and physics, and identify fluid types in the subsurface.
6. Understand the principles of mapping a subsurface reservoir and estimating volumetrics.

**Expectations**

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. Note that this is VERY important, as we are together for 4.5 hours in one afternoon. You will get bored of listening to me talk, and I CAN TALK. I need DISCUSSION, not complete lecturing.

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.

**Grading Policy**

<table>
<thead>
<tr>
<th>Score Range</th>
<th>Grade</th>
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<tbody>
<tr>
<td>100-90%</td>
<td>A</td>
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<tr>
<td>89-80%</td>
<td>B</td>
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<td>79-70%</td>
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<tr>
<td>69-60%</td>
<td>D</td>
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<tr>
<td>59-0%</td>
<td>F</td>
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*Field Trip (100 pts)*

Field trip to Carthage to tour a working rig. There will be an accompanying assignment. If the field trip is missed, there will be a much harder assignment.

*Tests (100 pts each; 200 pts total)*

There will be two tests. Makeup tests can only be given in written documented exceptional situations.
Labs (10 worth 40 or 80 pts each; 440 pts total)
Lab runs the full period. There will be nine labs, each worth 40 to 80 points each. The labs which take more than one week are worth 80 pts (the Mapping lab and the Kingdom mapping/interpretation labs are worth 80 points each). You will need a calculator and colored pencils for lab regularly. Labs will be due the following week in lab. We will use both 330 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 standard geologic computer programs. When we are done with this class, you will also have a micro-certification in IHS Kingdom to add to your resume.

Assignments (worth 25 pts each; ~50 to 100 points total)
Assignments are given during lecture.

Group Presentation (150 pts)
Group presentation on a basin of choice. More information to come soon.

Paper on Group Presentation (100 pts)
Paper on the group presentation. More information to come soon.

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).

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: GEOL 1304 (Historical Geology)

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.
<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/Dates</th>
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<tbody>
<tr>
<td>1</td>
<td>28-Aug</td>
<td>Intro</td>
<td>Selley 1 &amp; 4; or KB 1</td>
<td>1</td>
<td>Well Logging -</td>
<td>100 petroleum</td>
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<td>How to Read one</td>
<td>products</td>
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<td>2</td>
<td>4-Sep</td>
<td>Petroleum</td>
<td>Selley 2; KB 14</td>
<td>2</td>
<td>Well Logging - GR, CAL</td>
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<td>3</td>
<td>11-Sep</td>
<td>Rig Visit</td>
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<td>4</td>
<td>18-Sep</td>
<td>Generation</td>
<td>Selley 5.4-5.5; KB 15</td>
<td>3</td>
<td>Well Logging - DEN, PE, NPHI</td>
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<td></td>
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<td>and Migration</td>
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<td>5</td>
<td>20-Sep</td>
<td>Subsurface Environment</td>
<td>Selley 5.1-5.3; KB 13, 20</td>
<td>4</td>
<td>Well Logging - Resistivity, SP</td>
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<td>6</td>
<td>25-Sep</td>
<td>Reservoirs</td>
<td>Selley 6; KB 4</td>
<td>5</td>
<td>X-Section</td>
<td>Volumetrics</td>
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<td>- Sandstones</td>
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<td>7</td>
<td>2-Oct</td>
<td>Reservoirs</td>
<td>KB 5</td>
<td>6</td>
<td>Mapping Exercise</td>
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<td>- Carbonates</td>
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<td>8</td>
<td>9-Oct</td>
<td>Cap rocks</td>
<td>Selley 7.4; KB 6</td>
<td>6</td>
<td>Mapping Exercise</td>
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<td>9</td>
<td>16-Oct</td>
<td>Midterm</td>
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<td>10</td>
<td>23-Oct</td>
<td>Traps</td>
<td>Selley 7</td>
<td>7</td>
<td>Kingdom</td>
<td>Geophysics</td>
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<td>11</td>
<td>30-Oct</td>
<td>Traps</td>
<td>KB 12</td>
<td>8</td>
<td>Kingdom Workflow</td>
<td>pt1</td>
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<td>12</td>
<td>6-Nov</td>
<td>No Class</td>
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<td>Thanksgiving Break</td>
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<td>13</td>
<td>13-Nov</td>
<td>Sedimentary</td>
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<td>Kingdom Workflow</td>
<td>pt2</td>
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<td>Basins</td>
<td>Selley 8</td>
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<td>14</td>
<td>27-Nov</td>
<td>Nonconventional</td>
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<td>Kingdom Workflow</td>
<td>pt 3</td>
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<td>Petroleum</td>
<td>Selley 9</td>
<td>10</td>
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<td>15</td>
<td>4-Dec</td>
<td>Resources</td>
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<tr>
<td>16</td>
<td>11-Dec</td>
<td>Presentations</td>
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<td>Finals Week</td>
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*Note that topics and dates of topics are subject to change. I will try to keep you updated.*
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

The Code of Student Conduct and Academic Integrity outlines the prohibited conduct by any student enrolled in a course at SFA. It is the responsibility of all members of all faculty, staff, and students to adhere to and uphold this policy.

Articles IV, VI, and VII of the new Code of Student Conduct and Academic Integrity outline the violations and procedures concerning academic conduct, including cheating, plagiarism, collusion, and misrepresentation. Cheating includes, but is not limited to: (1) Copying from the test paper (or other assignment) of another student, (2) Possession and/or use during a test of materials that are not authorized by the person giving the test, (3) Using, obtaining, or attempting to obtain by any means the whole or any part of a non-administered test, test key, homework solution, or computer program, or using a test that has been administered in prior classes or semesters without permission of the Faculty member, (4) Substituting for another person, or permitting another person to substitute for one’s self, to take a test, (5) Falsifying research data, laboratory reports, and/or other records or academic work offered for credit, (6) Using any sort of unauthorized resources or technology in completion of educational activities.

Plagiarism is the appropriation of material that is attributable in whole or in part to another source or the use of one’s own previous work in another context without citing that it was used previously, without any indication of the original source, including words, ideas, illustrations, structure, computer code, and other expression or media, and presenting that material as one’s own academic work being offered for credit or in conjunction with a program course or degree requirements.

Collusion is the unauthorized collaboration with another person in preparing academic assignments offered for credit or collaboration with another person to commit a violation of any provision of the rules on academic dishonesty, including disclosing and/or distributing the contents of an exam.

Misrepresentation is providing false grades or résumés; providing false or misleading information in an effort to receive a postponement or an extension on a test, quiz, or other assignment for
the purpose of obtaining an academic or financial benefit for oneself or another individual or to injure another student academically or financially.

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](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, 468-300+ / 468-100+ (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/](http://www.sfasu.edu/disabilityservices/).

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

On-campus Resources:
**The Dean of Students Office**
Location: Rusk Building, 3rd floor lobby
[www.sfasu.edu/deanofstudents](http://www.sfasu.edu/deanofstudents)
936.468.7249
dos@sfasu.edu

**SFA Human Services Counseling Clinic**
Location: Human Services, Room 202
[www.sfasu.edu/humanservices/139.asp](http://www.sfasu.edu/humanservices/139.asp)
936.468.1041

**The Health and Wellness Hub “The Hub”**
Location: corner of E. College and Raguet St.
To support the health and well-being of every Lumberjack, the Health and Wellness Hub offers comprehensive services that treat the whole person – mind, body and spirit. Services include:
- Health Services
- Counseling Services
- Student Outreach and Support
• Food Pantry
• Wellness Coaching
• Alcohol and Other Drug Education

www.sfasu.edu/thehub
936.468.4008
thehub@sfasu.edu

Crisis Resources:
• Burke 24-hour crisis line: 1.800.392.8343
• National Suicide Crisis Prevention: 9-8-8
• Suicide Prevention Lifeline: 1.800.273.TALK (8255)
• johCrisis Text Line: Text HELLO to 741-741