

## PETROLEUM GEOLOGY (GEOL 4190/5190)

### When Offered

This course is offered in each Spring semester with the following two sections:

- Section 1- Petroleum Geology for Geologists (GEOL 4190/5190-01).
- Section 2- Petroleum Geology for Engineers (GEOL 4190/5190-02).

### Course Description

This course covers general aspects of the geology of petroleum and is based on the following topics:

- **1.0 Introduction**
  - Historical review of petroleum exploration
    - From the past to present
  - The concept of petroleum geology
    - Overview of the course
- **2.0 Physical and chemical properties of hydrocarbons**
  - Natural gases
  - Gas hydrates
  - Crude oil
- **3.0 Concepts and methods for petroleum exploration**
  - Well drilling and completion
  - Formation evaluation
  - Surface geophysical exploration methods
  - Borehole geophysics and time-lapse seismology
  - Subsurface geology
  - Remote sensing
  - Seismic Stratigraphy
- **4.0 The subsurface**
  - Subsurface waters
  - Subsurface temperatures
  - Subsurface pressures

- Subsurface fluid dynamics
- **5.0 Generation and migration of petroleum**
  - Origin
  - Modern organic processes on the earth's surface
  - Formation of Kerogen
  - Petroleum migration
  - The petroleum system
- **6.0 The reservoir**
  - Porosity, permeability, capillary pressure and their relationships
  - Diagenesis and reservoir quality
  - Reservoir continuity
  - Reservoir types
  - Reservoir characterization and reserve calculation
  - Production methods
- **7.0 Traps and seals**
  - Definition of a trap
  - Distribution of petroleum within a trap
  - Seals and cap rocks
  - Classification of traps
    - Structural traps
    - Diapiric traps
    - Stratigraphic traps
    - Hydrodynamic traps
    - Combination traps
- **8.0 Sedimentary basins and petroleum systems**
  - Fundamental concepts
  - Mechanisms of basin formation
  - Classification of sedimentary basins
    - Cratonic basins

- Troughs
- The rift-drift suite of basins
- Strike-slip basins
- Sedimentary basins and petroleum systems
- **9.0 Nonconventional petroleum resources:**
  - Fundamental concepts
  - Tar sands
  - Oil shales
  - Shale gas/oil
  - Tight gas/oil sand
  - Coal-bed methane
  - Gas hydrates
- **10.0 Prospect evaluation**
  - Prospect appraisal
    - Geologic aspects
    - Economic aspects
  - Assessment of reserves

### **Prerequisites**

None. All the geological concepts will be covered in the class.

### **Student learning outcomes**

Upon completion of this course, the students will learn the geology of petroleum, including its origin, migration, different types of traps and seals, general overview of the sedimentary basins, petroleum systems, and how to characterize and assess the petroleum reserves.

### **Required texts and readings**

Although all the reading materials of the course will be provided in the class, the students will benefit by consulting from the following textbooks:

- Selley, Richard C. and Sonnenberg, Stephen A., 2015, *Elements of petroleum geology*, 3<sup>rd</sup> edition, Academic Press.
- Slatt, Roger M., 2006, *Stratigraphic reservoir characterization for petroleum geologists, geophysicists, and engineers*, Handbook of petroleum exploration and production **6**, Elsevier.

### **General requirements and expectations from the course**

Lectures- lectures will not cover the entire textbooks but will provide the key concepts. In addition, the lectures will also provide materials outside of the textbooks.

Assignments- throughout the course, there will be several assignments to emphasize different concepts covered.

### **Examinations**

There will be a midterm and a final examination and two quizzes. The date of the final examination is generally pre-scheduled and will be announced on day 1 of the class. The dates of the midterm and quizzes will be decided on mutually agreeable dates.

### **Disability support**

The University of Wyoming is committed to providing equitable access to learning opportunities for all students. If you have a disability, including but not limited to physical, learning, sensory or psychological disabilities, and would like to request accommodations in this course due to your disability, please register with and provide documentation of your disability as soon as possible to Disability Support Services (DSS), Room 128 Knight Hall. You may also contact DSS at (307) 766-3073 or [udss@uwyo.edu](mailto:udss@uwyo.edu). It is in the student's best interest to request accommodations within the first week of classes, understanding that accommodations are not retroactive. Visit the DSS website for more information at: [www.uwyo.edu/udss](http://www.uwyo.edu/udss).

### **Academic dishonesty policy**

Academic dishonesty will not be tolerated in this class. Cases of academic dishonesty will be treated in accordance with UW Regulation 2-114. The penalties for academic dishonesty can include, at my discretion, an "F" on an exam, an "F" on the class component exercise, and/or "F" in the entire course. Academic dishonesty means anything that represents someone else's ideas as your own without attribution. It is intellectual theft – stealing - and includes (but is not limited to) unapproved assistance on examinations, plagiarism (use of any amount of another person's writings, blog posts, publications, and other materials without attributing that material to that person with citations), or fabrication of referenced information. Facilitation of another person's academic dishonesty is also considered academic dishonesty and will be treated identically.

### **Classroom statement of diversity**

The University of Wyoming values an educational environment that is diverse, equitable, and inclusive. The diversity that students and faculty bring to class, including age, country of origin, culture, disability, economic class, ethnicity, gender identity, immigration status, linguistic, political affiliation, race, religion, sexual orientation, veteran status, worldview, and other social and cultural diversity is valued, respected, and considered a resource for learning.

## **Classroom behavior policy**

At all times, treat your presence in the classroom and your enrollment in this course as you would a job. Act professionally, arrive on time, pay attention, complete your work in a timely and professional manner, and treat all deadlines seriously. You will be respectful towards your classmates and instructor. Spirited debate and disagreement are to be expected in any classroom and all views will be heard fully, but at all times we will behave civilly and with respect towards one another. Personal attacks, offensive language, name-calling, and dismissive gestures are not warranted in a learning atmosphere. As the instructor, I have the right to dismiss you from the classroom, study sessions, electronic forums, and other areas where disruptive behavior occurs. No video or audio recording during class is allowed to protect the privacy of your fellow students.

## **Attendance and absence policies**

*Attendance:* There is no explicit attendance taken in GEOL4190, however you must attend the class meetings so that you can participate in the team exercises which will be given in the class.

*Missed or Late Work.* You will only be able to make up missed exams if you have a valid Authorized Absence (granted by the Dean of Students, according to The University policies on excused absences as outlined in UW Regulation 2-108 (Student Attendance Policy). Work turned in late (without prior consent of the instructor) may have docked points at a rate of 10% per day. All assignments will be posted on the WYOCourses at least two weeks (and sometimes longer) prior to their submission deadlines. So, even an excused absence on the day of the submission deadline will not be an excuse for late submission. In addition, the answers for each assignment will be posted on the WYOCourses one week after its submission deadline. Therefore, submitting an assignment after its answers are posted will not be considered for grading.

## **Grading Policy**

Grading will be on the A-F scale as follows:

- A → 100% to 90%
- B → 80% to < 90%
- C → 70% to < 80%
- D → 60% to < 70%
- F → less than 60%

Final grades will be based on four components- assignments, quizzes, midterm and the final examination.

## **Campus Resources**

DISABILITY SUPPORT SERVICES: [udss@uwyo.edu](mailto:udss@uwyo.edu), 307-766-3073, 128 Knight Hall, [www.uwyo.edu/udss](http://www.uwyo.edu/udss)

COUNSELING CENTER: [uccstaff@uwyo.edu](mailto:uccstaff@uwyo.edu), 307-766-2187, 766-8989 (After hours), 341 Knight Hall, [www.uwyo.edu/ucc](http://www.uwyo.edu/ucc)

ACADEMIC AFFAIRS: 307-766-4286, 312 Old Main, [www.uwyo.edu/acadaffairs](http://www.uwyo.edu/acadaffairs)

DEAN OF STUDENTS OFFICE: [dos@uwyo.edu](mailto:dos@uwyo.edu), 307-766-3296, 128 Knight Hall, [www.uwyo.edu/dos](http://www.uwyo.edu/dos)

UW POLICE DEPARTMENT: [uwpd@uwyo.edu](mailto:uwpd@uwyo.edu), 307-766-5179, 1426 E Flint St,  
[www.uwyo.edu/uwpd](http://www.uwyo.edu/uwpd)  
STUDENT CODE OF CONDUCT WEBSITE: [www.uwyo.edu/dos/conduct](http://www.uwyo.edu/dos/conduct).