#### Revised 4/27/2012 per Curriculum Review Committee

See <a href="http://www.uaf.edu/uafgov/faculty-senate/curriculum/course-degree-procedures-/">http://www.uaf.edu/uafgov/faculty-senate/curriculum/course-degree-procedures-/</a> for a complete description of the rules governing curriculum & course changes.

D Petroleum Engineering C / CEM

Catherine Hanks

and the basic tools used exploration and exploitation, including subsurface mapping, well logging and exploration geophysics. *Prerequisites: Graduate standing or permission of the instructor*. Cross-listed with GEOS F646. Stacked with GEOS F446. (3 + 0)

GEOS F646 Petroleum Geology

3 Credits Offered Fall Even-numbered Years

Examines the origin of petroleum, the geologic controls on its distribution and accumulation and the basic tools used exploration and exploitation, including subsurface mapping, well logging and exploration geophysics. *Prerequisites: Graduate standing or permission of the instructor.* Cross-listed with PETE F646. Stacked with GEOS F446. (3 + 0)

GEOS F446 Petroleum Geology

3 Credits Offered Fall Even-numbered Years

Examines the origin of petroleum, the geologic controls on its distribution and accumulation and the basic tools used exploration and exploitation, including subsurface mapping, well logging and exploration geophysics. *Prerequisites: GEOS F314 and F322 or equivarient.*Stacked with GEOS F646. (3+0) permission of the instructor.

classification appropriately	Undergraduate courses only. otherwise leave fields blank.	Consult With CEA Curric	Jaiaiii O	арріў 5	01 11
H = Humanities S = Social Sciences					
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	to the Provost for fee approval? Y⊛/No			
Has the course be Yes/No	een offered as special topics or trial course previou	ısly?	Yes	

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http://www.uaf.edu/uafgov/faculty-senate/curriculum/course-degree-procedures-/uaf-syllabus-requirements/
The Faculty Senate curriculum committees will review the syllabus to ensure that each of the items listed below are included. If items missing or unclear, the proposed course (or

## **GEOS 446**

# **Petroleum Geology**

## 3 credits

Hydrocarbons fuel today's economy, but remain a relatively rare natural resource. The objective of this course is to review the geologic controls on the distribution and accumulation of

A = 93-96

A - = 90-92

B + = 87 - 89

B = 83-86%

B- = 80-82

C + = 77-79

C = 73 - 76%

C - = 70 - 72

D + = 65-69

D = 55-64%

D - = 50 - 54

F = <54%

The instructor reserves the right to curve the grades where appropriate.

Late homeworks will not be accepted.

### **COURSE OUTLINE: (28 CLASS DAYS)**

Week	Topic	Homeworks	Readings
1	Intro—Why petroleum?		
	What is Petroleum?		Selley Ch. 2
	Organic vs. inorganic origin of		
	petroleum		
	Chemical Properties		
	Physical Properties	** 14 0 1 1 1	
2	The subsurface environment	Hwk 1: Calculating	Selley, Ch. 4
	Temperature within the earth	geothermal	
	Pressure	gradients	
	Subsurface waters		
	Methods of Exploration	Hwk 2: Rock id	Selley, Ch. 3.1, 3.2,
	Drilling a well		3.5
	Well logging		
3	Subsurface geology and maps	<b>Hwk 3: Examining</b>	
	Formation Evaluation	well cuttings and	
	Gravity and Magnetics	well logs	
4	Geophysical methods—Reflection	Hwk 4: Interpreting	Selley, Ch. 3.3
•	Seismicacquisition	seismic	Sency, Ch. 3.3
	Seismic interpretation, 3 D, 4D		
5	The source: How oil forms		Selley, Ch. 5
	Source rock characteristics		
	Productivity and Preservation of		
	Organic Matter.		
	Hydrocarbon Maturation		

Hydrocarbon Migration	
Midterm I	

## 6 The Reservoir:

What makes a good reservoir rock?

Porosity.

Permeability.

Effects of Diagenesis on Reservoir

Quality.

	Structural modifications of a reservoir: Fractured reservoirs		
11	Timing of Trap Development Relative to Migration. Petroleum systems & plate tectonic habitat Passive continental margins Passive continental margins, cont	Hwk 9: Using seismic data for structural interpretation and timing	Selley, Ch. 8
12	Convergent margins Strike slip basins	Hwk 10: Plate tectonic setting of modern day basins	

### PETE/GEOS 646

## **Petroleum Geology**

#### 3 credits

Hydrocarbons fuel today's economy, but remain a relatively rare natural resource. The objective of this course is to review the geologic controls on the distribution and accumulation of hydrocarbons, how those hydrocarbons are found, and how they are subsequently extracted. At the end of the course, students should be able to explain:

the subsurface environment
the origin and nature of hydrocarbons
how and where hydrocarbons accumulate
methods of hydrocarbon exploration and exploitation
unconventional hydrocarbon resources
basic reservoir engineering techniques

Examples from classic hydrocarbon-producing regions will be used to illustrate the principles and techniques discussed in class.

Students will be assigned additional readings each week that expand on the topics discussed in class. Students will then use the concepts and techniques discussed in both the class and the readings to research a petroleum topic related to their own area of research. Results will be summarized as a paper and presented to the class as a short presentation.

**Prerequisites:** Graduate standing or permission of the instructor

Instructor: Cathy Hanks, NSB 346/Duckering 417, 474-5562 or 2668

chanks@gi.alaska.edu

Office Hours: TBD

Text: Selley, 1999, Elements of Petroleum Geology. Academic Press, 470 p.

Additional readings will be assigned each week to augment the lectures.

#### **Class format:**

The class will consist of lectures and homework assignments. Additional readings will be assigned each week to augment the lecture material given in class.

### **Grading Policy**

The course grade will be a letter grade (plus, minus) and will be based on: 2 mid-term exams (20% each)

3 Subsurface geology and maps Formation Evaluation

9	Trap types:  Structural Traps.  Stratigraphic Traps.  Combination Traps.  Hydrodynamic Traps.	Hwk 8: Constructing subsurface structure maps; Identifying play types from subsurface structure maps	
	Salt-related structures		
10	Midterm II		
	Structural modifications of a reservoir: Fractured reservoirs		
11	Timing of Trap Development Relative to Migration. Petroleum systems & plate tectonic habitat	Hwk 9: Using seismic data for structural interpretation and timing	Selley, Ch. 8
	Passive continental margins Passive continental margins, cont	tining	
12	Convergent margins Strike slip basins	Hwk 10: Plate tectonic setting of modern day basins	
	Reservoir engineering: Reserve calculations	Hwk 11: Simple reserve calculation	Selley, Ch. 6.8-6.9
13	Well Drilling and Completion		
	Non conventional hydrocarbon resources Viscous oil Gas hydrates Coal bed methane		
14	Tight gas Shale resource plays		
	Student presentations	1	1

**Disability Services:** The Office of Disability Services implements the Americans with Disabilities Act (ADA), and insures that UAF students have equal access to the campus and course materials. We will work with the Office of Disabilities Services (208 Whitaker Building, 474-5655) to provide reasonable accommodation to students with disabilities.