

PETE/GEOS 370

Fall 2009

Sedimentary and Structural Geology for Petroleum Engineers

Lecture: Tuesday, Thursday 2-3:30 pm, Reichardt 202

Lab: Thursday, 3:40-6:40, Reichardt 229 & 233

Monday, 6-9 pm., Reichardt 233

Prerequisite: GEOS 101 OR GE 261 OR permission of instructor

Instructor: Cathy Hanks, NSF 346, 474-5562 or Duckering 417, x2668,
chanks@gi.alaska.edu

Office hours: Duckering 417, M,W 2:00-3:30 pm

Reichardt 346 on T, Th 3:45-5:00 pm

Lab Instructors: Raelene Wentz, ztnew@hotmail.com; Reichardt 312, x7585

Kevin Stack, kpstack@alaska.edu; Reichardt 312, x7585

Texts: Nichols, G., 2009, Sedimentology and Stratigraphy (2nd edition), Wiley-Blackwell.

Park, R.G., 1997, Foundations of Structural Geology, 3rd edition

(Other selected readings may be placed on reserve in the library)

The objective of this course is to provide a petroleum engineer with an understanding of sedimentary and structural geology sufficient to enable him or her to interact effectively with petroleum geologists in industry. This course will introduce the petroleum engineer to some of the fundamental concepts, techniques, tools, and terminology in use today by petroleum exploration and production geologists. The topics to be covered in lecture will include:

- Stratigraphy and the significance of geologic time
- Sedimentary rocks, their depositional environments, geometries, and porosity and permeability patterns.
- Basic mechanical behavior of rocks; brittle vs. ductile behavior; folding and faulting
- Plate tectonics & basin evolution

The course grade will be a letter grade (plus, minus) and will be based on 2 mid-term exams and a final exam (22.5% each) and the lab grade (32.5%). Grading will be based on the following:

A = 90-100%

B = 80-89%

C = 70 - 79%

D = 55-69%

F = <55%

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

The laboratory portion of this course is fundamental for illustrating the types of data available to petroleum geologists, and the skills and tools commonly used by them every day in industry. Topics to be covered in lab will include rock and mineral identification, surface and subsurface mapping, and map interpretation. Please bring a hand lens, pencil, ruler, and eraser to lab.

Preliminary Lecture and Lab Schedule

Lecture	Topic	Reading	Labs
	PART 1: STRATIGRAPHY AND SEDIMENTATION		
Sept. 3	Introduction Basic stratigraphic principles & nomenclature	Nichols, Ch. 1 & 19	
8	Weathering, sediments, and sedimentary rocks	Nichols, Ch. 6, 2, 3 (*Ch. 6, 2 & 3)	
10	Sedimentary rocks (cont)	Nichols, Ch. 2, 3 (*Ch. 2 & 3)	Lab 1: Rocks and minerals
15	Transport and deposition of sediment: processes; Sedimentary structures	Nichols, Ch. 4 (*Ch. 4)	
17	Sed Processes (cont)—Erosional, depositional, deformational structures Subsurface tools—gamma ray, resistivity, sp Diagenesis – compaction, cementation, secondary porosity;	Nichols, Ch. 18 (*Ch. 17)	Lab 2: Clastic sedimentary rocks
22	Depositional environments: alluvial fans and fan deltas; fluvial systems	Nichols, Ch. 9 (*Ch. 8.4 & 9)	
24	Depositional environments: deltas and estuaries	Nichols, Ch. 11, 12 & 13 (*Ch. 11, 12 & 13)	Lab 3: Fossils and geologic time
29	Depositional environments: shore zone and shallow marine systems	Nichols, Ch. 14 (*Ch. 14.1-14.4, 14.10)	
October 1	EXAM 1		Lab 4: Facies and depositional environments
6	Guest Lecture: Basics of sequence stratigraphy	Nichols, Ch. 23 (*Ch. 21)	

8	Acquiring subsurface data—seismic data acquisition and mapping	Lillie, pp. 100-134 North, pp. 413-435	Lab 5: Sequence and seismic stratigraphy
13	Depositional environments: eolian systems	Nichols, Ch. 8 (*Ch. 8-1-8.7)	
15	Depositional environments: slope and base-of-slope systems Depositional environments: carbonates pt 1	Nichols, Ch. 16 (*Ch. 15) Nichols, Ch. 15 (*Ch. 14.5-14.10)	Lab 6: Well logs and stratigraphic correlation
20	Depositional environments: carbonates pt 2		
22	Depositional environments: anoxic environments, deposition of organic rich rocks, generation of hydrocarbons	Nichols, Ch. 18.7 (*Ch. 17.8)	Lab 7: Carbonate sedimentary rocks
	PART 2: STRUCTURAL GEOLOGY		
27	The geologic conditions needed for HC accumulations How rocks deform: stress and strain	Park, pp. 55-79	
29	Behavior of materials Brittle behavior: Faults and fractures Part 1	Park, Ch. 2 & 9	Lab 8: Topographic and geologic maps (Park, Ch. 1.3)
Nov. 3	Review session		
5	EXAM 2	Park, Ch. 3 & 10	Lab 9: Faults
10	Faults and fractures (continued)		
12	Ductile behavior: Folds		Lab 10: Folds
17	Folds (cont); folds and fractures		
19	Thrust systems; Structure of the earth and plate tectonics	Park, Ch. 13 & 14	Lab 11: Folds & thrust faults
24	Rifts and passive margins & salt-related structures	Park, Ch. 15 Nichols, Ch. 24 (*Ch. 23)	
26	Thanksgiving Break		
Dec. 1	Extensional petroleum provinces; Convergent margins		Lab 12: Prudhoe Bay
3	Convergent margins (cont); strike slip		

	margins		
8	Review session		Prudhoe Bay (continued)
10	EXAM 3		

**from Nichols, 1st edition*

Course Policies: Attendance at class is your responsibility. Students are responsible for making up any missed work (lectures and labs). Students are encouraged to arrive to class and lab on time. Make-up examinations will be held only under exceptional circumstances (e.g. illness, family crises, etc.). Medical documentation will be required to confirm illnesses. We follow the university guidelines for plagiarism/academic integrity as outlined in the current UAF catalog (p. 71-72). Students are encouraged to work cooperatively on labs and assignments, but all work that is turned in—labs, homeworks, in class and take home exams—is expected to be their own work.

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 (203 WHIT, 474-7043) to provide reasonable accommodation to students with disabilities.