

Pete/Geos 370

Fall 2007

Sedimentary and Structural Geology for Petroleum Engineers

Lecture: Tuesday, Thursday 2-3:30 pm NSF 229

Lab: Thursday, 3:40-6:40, NSF 229

Pre-requisite: 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 by appointment

Lab Instructor: Aditya Deshpande, Duckering 408, ftaud@uaf.edu

Texts: Leeder, M.E., 1996, Sedimentology and Sedimentary Basins, Blackwell Science, London

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 based on 2 mid-term exams and a final exam (22.5% each) and the lab grade (32.5%).

The laboratory portion of this course will be 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. 6	Introduction Basic stratigraphic principles & nomenclature	Leeder, p. 3-11	Fossils and geologic time
11	Weathering, sediments, and sedimentary rocks	Leeder, p. 15-77	
13	Sedimentary rocks (cont)		Rocks and minerals
18	Transport and deposition of sediment: processes; Sedimentary structures	Leeder, p. 77-144	
20	Diagenesis – compaction, cementation, secondary porosity		Clastic sedimentary rocks
25	Depositional environments: alluvial fans and fan deltas; fluvial systems	Leeder, p. 307-339	
27	Depositional environments: deltas and estuaries	Leeder, p. 371-397	Carbonate sedimentary rocks
October 2	Depositional environments: shore zone and shallow marine systems	Leeder, p. 398-413. 444-464	
4	Depositional environments: slope and base-of-slope systems	Leeder, p. 465-496	Facies and depositional environments
9	EXAM 1		
11	Depositional environments: lacustrine & eolian systems	Leeder, p. 340-356; 295-306	Well logs and stratigraphic correlation
16	Depositional environments: carbonates	Leeder, p. 414-443	
18	Depositional environments: anoxic environments, deposition of organic rich rocks, generation of hydrocarbons	Link, pp. 275-288	Topographic and geologic maps
23	Basin analysis: seismic and sequence stratigraphy	Leeder, p. 258-287	
	PART 2: STRUCTURAL GEOLOGY		
25	Acquiring subsurface data—seismic data acquisition and mapping	Lillie, pp. 100-134 North, pp. 413-435	Sequence and seismic stratigraphy

30	How rocks deform: stress and strain	Park, pp. 55-70	
Nov. 1	Behavior of materials	Park, pp. 71-79	Faults I
6	Behavior of materials (cont)		
8	EXAM 2		Faults and Fault Rocks
13	Brittle behavior: Faults and fractures	Park, pp. 9-24; pp. 91-101	
15	Faults and fractures (continued)	Park, pp. 25-39	Folds
20	Ductile behavior: Folds	Park, pp. 101-120.	
22	<i>Thanksgiving Break</i>		<i>No Lab</i>
27	Folds (cont)		
29	Thrust systems	Park, pp. 15-20	Folds & thrust faults
Dec. 4	Structure of the earth and plate tectonics	Park, pp.141-159	
6	Plate tectonics, rifts and passive margins	Park, pp. 161-173 Leeder, pp. 497-530	Prudhoe Bay
11	Extensional structures & salt-related structures		
13	Plate tectonics and convergent & strike slip margins		Prudhoe Bay (continued)

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).

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.