Geos 421 – Sedimentology (3 credits)

Location: Rm. 229 Reichardt Bldg.
Lectures: Mon., Wed., - 9:15 AM - 10:15 AM
Lab: Mon. 2:00-5:00 PM
Prerequisites: Geos 213 or permission of instructor.

Instructor: Paul McCarthy
Office: Rm. 336 REIC
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Office hours: Wednesday 3:00-5:00 PM

Teaching Assistant: Peter Flaig
Office: Rm. 305 REIC
E-mail: fsppf1@uaf.edu

Required Text:
Nichols, G. (1999). Sedimentology & Stratigraphy. Blackwell Science. London.

Other useful references:
Tucker, M. E. (2003). Sedimentary Rocks in the Field (3rd edition). John Wiley & Sons, New York.

Boggs, S. (2001). Principles of Sedimentology and Stratigraphy (3rd edition). Prentice Hall, New York.

Miall, A.D. (2000) Principles of Sedimentary Basin Analysis (3rd edition). Springer-Verlag, Berlin.

Leeder, M.R. (1999). Sedimentology and Sedimentary Basins: from turbulence to tectonics. Blackwell Science, London.

Allen, P.A. (1997). Earth Surface Processes. Blackwell Science, London.

Walker, R.G. and James, N.P. (1992) Facies models: response to sea level change. Geological Association of Canada, St. John's.

Course Description:
Origin, classification, composition, transportation, deposition and diagenesis of sediments. Emphasis on sedimentary processes, sedimentary petrology and interpretation of ancient sedimentary rocks. Laboratory covers identification and description of hand specimens as well as techniques of textural and compositional analysis.

Course Goals:

Sedimentology is the scientific study of the classification, origin, dispersal, diagenesis and interpretation of sedimentary rocks. From the fossils, textures and structures in sedimentary rocks, geologists can decipher clues that provide insight into past climates, the configuration of ancient continents and mountain chains, and the distribution of ocean environments and ecosystems. Sedimentary rocks are also economically significant, forming important hosts for oil, gas, coal uranium, gypsum and, increasingly, water! The goal of this course is to provide you with a basic understanding of sedimentary processes, structures and environments so that you are able to accurately interpret sedimentary environments from rocks.

Student Learning Outcomes:

By the end of the course students will be able to:

- identify major minerals and sedimentary rocks in hand specimen and outcrop
- identify and interpret major sedimentary structures
- understand and explain major sedimentary processes
- describe simple facies models for depositional environments
- understand the importance of understanding sedimentary depositional environments for basin analysis, paleoenvironmental reconstruction and resource exploitation
- be able to decipher simple sedimentary environments from rocks in the field.

Instructional Methods:

2 lecture hours and 3 laboratory hours per week.

Evaluation:

Student grades will be calculated based upon performance on exams, lab assignments, a research paper and a seminar. The research paper should be a minimum of 10 pages and a maximum of 15 pages in length. It can examine any sedimentology topic you wish, but the topic must be approved in advance by the instructor. The seminar will involve a brief (~ 10 minutes) powerpoint presentation of your research paper to the entire class. I will assign a final letter grade using the following scheme: A+ (95-100), A (93-94.9), A- (90-92.9), B+ (87-89.9), B (83-86.9), B- (80-82.9), C+ (77-79.9), C (73-76.9), C- (70-72.9), D+ (65-69.9), D (55-64.9), D- (50-54.9), F (less than 50%). The final grade will be calculated as follows:

- Mid-term #1 - 15%
- Mid-term #2 - 15%
- Lab assignments - 20%
- Research paper - 15%
- Seminar - 5%
- Final exam - 30%

Tentative Lecture Outline

January 28 (M)	Production of clastic sediment - weathering	Nichols p. 76-86

January 30 (W)	Weathering rates & products of weathering	Nichols p. 86-88
January 28 - Lab 1	*Weathering trends*	
February 4 (M)	Particle transport by fluids	Nichols p. 37-43
February 6 (W)	Unidirectional current flows and bedforms	Nichols p. 43-52
February 4 - Lab 2	*Clastic Sediments & Sedimentary Rocks*	Nichols p. 10-24
February 11 (M)	Sediment transport by waves	Nichols p. 52-54
February 13 (W)	Sediment gravity flows	Nichols p. 54-58
February 11 - Lab 3	*Clastic sedimentary rocks*	Nichols p. 35-36
February 18 (M)	Sedimentary structures	Nichols p. 58-61
February 20 (W)	Sedimentary structures	
February 18 - Lab 4	*Sedimentary Processes*	
February 25 (M)	Chemical & biochemical sedimentary rocks	Nichols p. 25-35
February 27 (W)	Diagenesis	Nichols p. 215-
February 25	***Mid-term #1***	
March 3 (M)	Alluvial fans & fan deltas	Nichols p. 102-107
March 5 (W)	Rivers	Nichols p. 111-127
March 3 - Lab 5	*Sedimentary Structures*	
March 10-14 (M & W)	**Spring break – no class**	**Spring break – no lab**
March 17 (M)	Deltas	Nichols p. 135-148
March 19 (W)	Estuaries	Nichols p. 149-166
March 17 – Lab 6	*Carbonate sedimentary rocks*	
March 24 (M)	Eolian environments	Nichols p. 96-102; 108-110
March 26 (W)	Lacustrine environments	Nichols p. 128-134
March 24 - Lab 7	*Basin Analysis*	Nichols p. 62-75; 229-240
March 31 (M)	Linear clastic shorelines	Nichols p. 167-179
April 2 (W)	Continental shelves	Nichols p. 180-193
March 31 - Lab 8	*Sequence Stratigraphy*	Nichols p. 290-298
April 7 (M)	Ocean basin sedimentation	Nichols p. 194-207

April 9 (W)	Carbonate shorelines, shelves and basins	Nichols p. 174-176; 186-192
April 7	***Mid-term #2***	
April 14 (M)	Glacial sedimentary environments	Nichols p. 89-95
April 16 (W)	Sea level and sedimentary sequences	Nichols p. 264-289
April 14 - Lab 9	*Analysis of mudrocks*	
April 21 (M)	Tectonics and Sedimentation	
April 23 (W)	Climate and Sedimentation	Nichols p. 316-328
April 26 – Lab 10 - weekend trip	*Field trip – measuring sedimentary rocks in outcrop*	
April 28 (M)	Subsidence and deposition	
April 30 (W)	Sedimentology in sedimentary basins	Nichols p. 299-315
May 5 (M)	**Research papers due** **Seminar presentation**	

Final exam – Friday, May 9, 2008 - 8-10 a.m.

Course policies:

Please try to arrive on time for class and lab. If you must leave class early, please try to leave quietly. Please try to remember to turn cell phones off before class. Attendance in class is up to you, but please be aware that it is unlikely that you will do well if you choose not to attend class. I will make my lectures available to you on CD, however, you should use them as templates and/or a framework for compiling your own notes!

Missed laboratories and exams cannot be made up unless you have discussed this with me in advance and/or you have a compelling reason (e.g. medical or family emergency, etc.). The final exam must be written during the examination period. Cheating, plagiarism and other academic misconduct will not be tolerated (see Student Code of Conduct www.uaf.edu/catalog/current/academics/regs3.html)

Support Services:

- Geology Dept. Computing Lab (Rm. 316 REIC)
- UAF Writing Center (474-5314)

Disabilities 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. I will work with the Office of Disabilities Services (203 WHIT, 474-7043) to provide reasonable accommodation to students with disabilities.

- This syllabus confoms to the UAF Syllabus Requirements passed by the UAF Faculty Senate (Meeting #123, May 3, 2004). Please take a moment to read and familiarize yourself with this syllabus.