

Florida Atlantic University

Fall Semester 2011

GLY 4500C

SEDIMENTATION AND STRATIGRAPHY

Prerequisites: GLY 2010 Evolution of the Earth or equivalent Introductory geology course, GLY 2100 History of the Earth and Life or equivalent Historical geology course

Lectures: Tuesday and Thursday: 10:30 AM – 11:50 PM, Room PS 337

Labs: Wednesday: 1:00 – 2:50 PM, Room PS 355

Instructor: Dr. Anton Oleinik **Office:** Physical Sciences Building, Rm. 358

Phone: (561) 297-3297 **E-mail:** aoleinik@fau.edu

Office hours: Tuesday & Thursday 5:00 – 6:30 PM and by appointment

Note: I will make every effort to be available during office hours. However, occasional conflicts, may force me to miss some office hours. Students may wish to call me prior to coming to the office, to ensure that I am in. I will also be available outside my regular office hours, please call or e-mail me and schedule an appointment.

Teaching Assistant: Michelle Chrpa

Office: PS 357

Text: Sam Boggs, Jr. Principles of Sedimentology and Stratigraphy, Fourth Edition, 2006, Pearson/Prentice Hall, 662 p. or Third Edition, 2001, Prentice Hall, 726 p. ISBN 0-13-154728-3

Course Description and Objectives:

- Overview of processes leading to formation of sediments and sedimentary rocks.
- Introduction to observation, classification, and various techniques of study of sediments and sedimentary rocks
- Interpretation of depositional environments, tectonic setting and provenance, and geologic history from macroscopic and microscopic examination of sedimentary samples.
- Examination of processes of sedimentation in the variety of marine, lacustrine and terrestrial depositional environments
- Review of methods and procedures of stratigraphy and approaches to interpretations of the sedimentary record.

Note: Some material that will be covered in the lecture is covered in the textbook insufficiently. Regular lecture attendance and taking notes are highly recommended for obtaining a good grade. Formal lectures will be augmented by slide presentations.

Exams and grading policy:

There will be two midterms and one final examination. Every exam (including final) is worth 30 points (without bonus questions). Exams may include identification of rock specimens in both hand samples and thin sections. Exam will typically consist of short answer questions of variable credit. Exams will typically include two to four bonus questions. There will be NO "make-up" exams unless arranged prior to the day of examination. Exams, including final, will not be comprehensive; covering only material dealt with immediately prior to each exam. Study guides will be provided prior to each exam. Laboratory exercises are due on the same day of the following week. Exceptions are labs # 3, 4, & 5. Labs 3 and 4 are designed for 2 lab periods each, Lab 5 is for 3 periods, due to the size of the assignment. Labs 3 and 4 will be due on the day, following second lab period, Lab 5 – due on the day following third lab period. The deadline for the last 2 labs (# 8 & 9) is December 6. No Exceptions! Each laboratory Exercise is worth 10 points if completed properly and submitted to the Teaching Assistant in time.

Total: 180 maximum possible points for the course (without bonus points): 3 exams @ 30 points each = 90 points, 9 labs @ 10 points each = 90 points.

Grading:

Approximate scale: A (>90%), B (89 – 80%), C (79 – 70%), D (below 70%), including +/-

CLASS POLICIES

ACADEMIC INTEGRITY:

Any incidence of cheating will result in a grade of "F" in the course and possible further disciplinary action. FAU has an Honor Code, and that infractions will have serious consequences.

http://www.fau.edu/regulations/chapter4/4.001_Code_of_Academic_Integrity.pdf

CLASSROOM ETIQUETTE:

In order to enhance and maintain a productive atmosphere for education, personal communication devices such as pagers, beepers, and cellular telephones are to be disabled in class sessions. (University policy which applies to all classes - see FAU Academic policies

(<http://www.fau.edu/academic/registrar/catalog/academics.php>.) Any use of these devices during a quiz or examination will be considered to be cheating, and will be penalized accordingly.

Communication devices (cell phones, pages, laptop computers, etc.) must be turned off and **out of reach** during all lectures and examinations.

STUDENTS WITH DISABILITIES

Any student with a disability, whether hidden or visible, is urged to contact the Office for Students with Disabilities, then to bring paperwork from their office to the instructor at the beginning of the semester. They will verify the disability, and suggest accommodations which can be made to assist the student. All such accommodations will be made utilizing the best practical method.

Tentative class schedule

(Variations from this syllabus may(and probably will!) occur in order to better meet the needs of this particular group, this particular course, and this particular instructor. Any changes will be announced in class.)

I. FROM GRAINS TO STONE - SEDIMENTS AND SEDIMENTARY ROCKS

Section and page references to the Textbook are given to the Fourth Edition, 2006

- August 23* Origin, Classification, and Distribution of Sedimentary rocks. Weathering, Soils and Paleosols. (Textbook: Part I: 1.1, 1.2, 1.3, 1.4: pp. 3 -19). Transport and deposition of siliciclastic sediment: fundamentals of fluid. Flow and particle transport. (Textbook: Part I: 2.1, 2.2, 2.3: pp. 25 – 35).
- August 24* Sedimentary textures: grain size, grain shape, porosity and permeability. (Textbook: Part II: 3.1, 3.2, 3.3, 3.4: pp. 51 – 71).
- August 25 - 30* Sedimentary structures: stratification, bedforms, and bedding-plane markings. (Textbook: Part II: 4.1, 4.2, 4.3, 4.4, 4.5, 4.6: pp. 74 – 114).
- August 31* Laboratory Exercise # 1 – Erosion and Sedimentary Particles**
- September 1* Conglomerates and Breccias. (Textbook: Part III: 5.3: pp. 135 – 137).
- September 6* Sands and Sandstones: Composition, Classification and Petrography. (Textbook: Part III: 5.2: pp. 119 – 131).
- September 7* Laboratory Exercise # 2 – Sieve Analysis of Sand and Statistical Parameters in Grain Size Analysis.**
- September 8* Provenance of siliciclastic sedimentary rocks. (Textbook: Part III; 5.2, p. 154)
- September 13* Diagenesis of Sandstones and Shales. (Textbook: Part III: 5.5: pp. 145 - 147, 5.6: p.154).
- September 14* Laboratory Exercise # 3 – Conglomerates and Sandstones**

September 15 Clays and Shales – Classification and methods of study
(Textbook: Part III: 5.4; pp. 139 – 144).

September 20 (Tuesday) Midterm Exam 1

September 21 Laboratory Exercise # 3 – Conglomerates and Sandstones

September 22 Review of the Midterm Exam 1. Pyroclastic Rocks, Pelagic and fossiliferous sediments and resulting sedimentary rocks, deep ocean sediments. (Part IV: 10.3, p. 352-364)).

September 27 Carbonate sedimentary rocks: composition and classification of limestones. (Textbook: Part III: 6.1 – 6.4: pp. 159 – 169)

September 28 Laboratory Exercise # 4 – Siltstones and shales

September 29 Carbonate sedimentary rocks: structures and textures, carbonate microfacies, dolomites, and diagenesis. (Textbook: Part III: 6.5 – 6.8: pp. 172 – 195).

October 4 Evaporites, Cherts, Phosphorites and Iron-rich Sedimentary rocks. (Textbook: Part III: 7.1 – 7.6: pp. 197 – 230).

October 5 Laboratory Exercise # 4 – Siltstones and shales

II. FROM THE MOUNTAINS TO THE SEA – REVIEW OF DEPOSITIONAL ENVIRONMENTS

October 6 Tectonic setting of sediment accumulation: classification of sedimentary basins, basin analysis. Principles of classification and interpretation of depositional environments (Textbook: Part V: 16.2 – 16.7: pp. 550 – 579, Part IV: 8.1, p. 245).

October 11 Carbonate platform, shelf, and slope depositional environments. (Textbook: Part IV: 11.1 – 11.6: pp. 368 – 393).

October 12 Laboratory Exercise # 5 – Carbonate and Chemical Sedimentary rocks

October 13 Terrestrial Environments: Fire & Ice: Desert (Eolian), Glacial depositional environments. (Textbook: Part IV: 8.3, pp. 258 – 265; 8.5, pp. 276 – 286); Lake (Lacustrine) and Fluvial depositional

environments. (Textbook: Part IV: 8.2, pp. 245 – 250; 8.4: pp. 268 – 274).

October 18 Transitional Environments: Deltaic, Tidal, Estuarine, and Lagoonal depositional environments. (Textbook: Part IV: 9.1, pp. 289 – 303; 9.6, pp. 326 – 331; 9.4, pp. 317-321; 9.5, pp.322-325).

October 19 **Laboratory Exercise # 5** – Carbonate and Chemical Sedimentary rocks

October 20 Beaches and Barrier Islands.
(Textbook: Part IV: 9.3, pp. 306 – 314)

October 25 (Tuesday) Midterm Exam 2

October 26 **Laboratory Exercise # 5** – Carbonate and Chemical Sedimentary rocks

October 27 Review of the Midterm Exam 2. Shallow Marine Environments: deposition on continental shelves. (Textbook: part IV: 10.2, pp. 335-347).

November 1 Deep Sea Environments: Continental Slope, Oceanic (Pelagic) depositional environments(Textbook: Part IV: 10.3, pp. 349 – 352).

November 2 **Laboratory Exercise # 5** – Carbonate and Chemical Sedimentary rocks

III. TIME AND SEDIMENTS – METHODS AND PRINCIPLES OF STRATIGRAPHIC ANALYSIS

November 3 Episodic nature of stratigraphic record, gaps in stratigraphic record, facies concept. Stratigraphic procedures, types of stratigraphic units, stratigraphic code, lithostratigraphic units, correlation of lithostratigraphic units (Textbook: Part V: 12.1 – 12.6: pp. 399 – 424)

November 8 Subsurface information: stratigraphy from boreholes, types of well logs and well log interpretation. (Textbook: Part V: 12.6 pp. 427 – 432)

November 9 **Laboratory Exercise # 6**. Facies and Lithostratigraphy.

- November 10* Geologic timekeepers – cyclic phenomena in stratigraphic record, cyclostratigraphy. Uniformitarianism and Catastrophism, event stratigraphy. (Textbook: Part V: 12.4 pp. 406 – 410)
- November 15* Sequence and seismic stratigraphy and sea-level fluctuations.(Textbook: Part V: 13.1 – 13.3: pp. 433 – 455).
- November 16*** **Laboratory Exercise # 7.** Well log interpretation.
- November 17 Fossils, biogeography, and biostratigraphy – distribution of organisms in space and time. (Textbook: Part V: 14.1 - 14.7: pp. 478 – 509).
- November 22* Geochronology and Chronostratigraphy. Isotope stratigraphy and radiometric dating. Stable Isotopes and isotopic events and correlations. Calibrating the Geologic Time Scale by Absolute Ages: Radiochronology. (Textbook: Part V: 15.4, pp. 533 – 548).
- November 23*** **Laboratory Exercise # 8.** Sequence Stratigraphy.
- November 29 Magnetostratigraphy. (Textbook: Part V: 13.4, pp. 462 – 469).
- November 30*** **Laboratory Exercise # 9.** Seismic stratigraphy.
- December 6 (Tuesday)** **10:30 AM – 1:00 PM** **Final Exam**