

COURSE SYLLABUS
GEOL 5330 – Mechanics of Sediment Transport, Erosion & Deposition
Spring 2013

Instructor Information:

Instructor: Brandon McElroy

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Office Hours: Wed 2-4 PM

Thu 9-10 AM

Course Information:

Meetings: WF, 9-11

Website: <http://www.gg.uwo.edu/geol5330>

Prerequisites: Consent of Instructor. This course relies heavily on calculus, physical mechanics, and differential equations, and without previous exposure to these topics, success in this course will require additional and substantial efforts.

Course Description:

Erosion, transport, and deposition of sediments are examined from a first-principles basis. Physical processes are derived from fluid dynamics, statistical mechanics, and mass conservation. These topics are then used to explore landscape and seascape evolution, morphodynamics, and stratigraphic construction.

Disability Statement:

If you have a physical, learning, sensory or psychological disability and require accommodations, please let me know as soon as possible. You will need to register with, and provide documentation of your disability to University Disability Support Services (UDSS) in SEO, room 330 Knight Hall.

Objectives/Outcomes/Standards: The objective of this course is to provide access to the empirical and theoretical background that forms the modern basis for evaluating and understanding sediment transport systems. Students who fully participate and complete this course can expect to be prepared to conduct scientific and professional research regarding the sedimentary evolution of Earth's surface, its stability, and its dominant processes.

Text(s) and Readings: No texts or readings are required in this course. The following recommendations are excellent sources to augment lectures and will be on reserve in the Geology library.

Physical Fluid Dynamics, D.J. Tritton

Erosion and Sedimentation, P.Y. Julien

Sedimentation Engineering, M. Garcia

Sedimentology and Sedimentary Basins, M. Leeder

Course Requirements/Assignments: This course consists of a series of 28 lectures that will create a coherent description of the processes that shape Earth's sediment covered surface and its shallow subsurface. Along with lectures will be a series of experimental flume demonstrations that coincide with course material and will form the basis for a portion of the four required problem sets. The problem sets form a substantial portion of the grading scheme, will be assigned on Wednesdays, and will be due on the Fridays of the following week. Because the material is a largely sequential progression, mastery of material along the way is paramount to success, and late problem sets are not acceptable.

Grading Standards:

Grades will be based on attendance and participation, problem sets, and 2 exams.

Problem sets: 50% (12.5% each)

Exams: 40% (20% each)

Participation: 10%

Ample time will be allowed for problem sets to be completed, and will not be accepted late beyond those exceptions allowed by university policy. Notes, calculators, rulers, etc. will not be needed nor allowed in exams. 2 hours will be allotted for each exam and they must be completed and turned in within that time. The final exam will rely heavily upon material in the last half of the class but because the material sequentially depends on previous topics, the final exam is necessarily cumulative in nature. Only in very exceptional circumstances will incomplete grades be allowed, and coursework must be completed in accordance with university policy.

Final grades will be assigned on a standard scale based on weighted scores from problem sets, exams, and participation:

90-100 A

80-90 B

70-80 C

60-70 D

<60 E

Attendance/Participation Policy:

University sponsored absences are cleared through the Office of Student Life. Lectures form the primary content of the course, and therefore attendance and participation is mandatory and is included in the grading scheme. If you must be absent, please have a university sponsored absence, or see me first (e.g. if you are to attend a conference, etc.).

Academic Honesty:

UW Regulation 6-802. (Suggested language: The University of Wyoming is built upon a strong foundation of integrity, respect and trust. All members of the university community have a responsibility to be honest and the right to expect honesty from others. Any form of academic dishonesty is unacceptable to our community and will not be tolerated [from the University Catalog]. Teachers and students should report suspected violations of standards of academic honesty to the instructor, department head, or dean. Other University regulations can be found at: <http://www.uwyo.edu/generalcounsel/new-regulatory-structure/index.html>)

The instructor may make changes to the syllabus as the course proceeds. If necessary, these changes will be announced in class. Substantive changes made to the syllabus shall be communicated in writing to the students.

Course Outline:

Jan

Wed 16 Conservation of sediment mass & surface evolution
Fri 18 Navier-Stokes
Wed 23 Law of the wall
Fri 25 Boundary layers
Wed 30 Grain-scale mechanics,
Problem set #1 handed out- Flow fields, Normal flow, Grain Stresses

Feb

Fri 1 Initial motion
Wed 6 Bedload - sand
Fri 8 Bedload – gravel,
Problem set #1 Due
Wed 13 Suspension
Fri 15 Suspended load
Wed 20 Turbulence
Fri 22 Stratification & Entrainment
Wed 27 Bed forms - ripples,
Problem set #2 handed out- Transport equations, Sediment profiles, Density currents

Mar

Fri 1 Bed forms - dunes
Wed 6 Bed forms - bars
Fri 8 Drag partitioning,
Problem set #2 Due
Wed 13 Total load
Fri 15 Mid-Term Exam
Wed 20 Spring Break
Fri 22 Spring Break
Wed 27 Morphodynamics,
Problem set #3 handed out- Bed stability, Roughness and drag, Morphodynamics
Fri 29 Easter Break

Apr

Wed 3 Rivers - bedrock
Fri 5 Rivers – gravel,
Problem set #3 Due
Wed 10 Rivers - sand
Fri 12 Deltas
Wed 17 Backwater zone
Fri 19 Hyperpycnal plumes
Wed 24 Continental margins
Problem set #4 handed out- Fluvial systems, Clinofolds, Basin filling
Fri 26 Fans - subaerial & subaqueous

May

Wed 1 Long profiles & basins
Fri 3 Carbonate, pyroclastic, and aeolian systems,
Problem set #4 Due (will be returned on Mon 6 for use in studying)
Wed 8 Final Exam