

ENVIRONMENTAL GEOMORPHOLOGY

Geography 306

Spring 2009

Instructor: Randall Schaetzl

Office: 128 Geography Building

Office Hours: T 10:00 - 1:00 and most other times that I am in my office

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TEXT: Strahler, A.H. and A.N. Strahler. 1992. Modern Physical Geography. 4th ed. Wiley and Sons Publishers. 638 pp.

LECTURES: M, W 12:40-2:00 in 120 Psych Building

COURSE GOALS: Although this course has no specific prerequisites, it is intended for those students who have a basic background in physical geography, biology, geology, soils and/or earth science. The major goal of GEO 306 is to provide students with an understanding of the evolution of Earth's physical landscape, so that they can later utilize this knowledge in making sound and intelligent environmental decisions. At many universities, a course like this would simply be called "Landforms", and that title would be appropriate here too.

Emphasis in the course will be on process vs form, with the premise that a knowledge of one may allow for accurate estimation of the other. That is, in order to understand what you see (the landforms that are there) in the natural world, you must also know how those landforms could have formed - the processes that have shaped them. Knowledge of process and form may allow one to make inferences about the two in a spatial sense: this is the essence of geographical geomorphology. The dating of landforms and sediments will be stressed. I will attempt to help everyone understand why a knowledge of landform and surface ages is important to land management. Examples of environmental management and mismanagement of the physical landscape will permeate but not dominate the course lectures and readings.

REQUIREMENTS:

General: Regular attendance is assumed, though not taken or checked. Expectations (and the final course curve) for graduate students will be the same as for undergraduates, with two exceptions: (1) graduate students will be expected to participate in **all** field trips, (2) expectations as per the quality of the research paper will be slightly greater for graduate students.

Readings: Most readings will come from the text, which I expect you to have read *before* class!

Exams and Assignments: GEO 306 has three 30-minute quizzes and a final exam, all of which will be of essay/short answer/definition format, along with some (few) objective questions. The quizzes will be given during the last half of class. **The final exam is cumulative.**

OTHER

Every attempt will be made to use the metric/Celsius systems in GEO 306. Students should familiarize themselves with these systems of measurement.

Research Paper: All students will write a 3-4 page (exclusive of references, figures, and tables) research paper on a topic of their choice. This is to be a scientific paper written in scientific paper format.

The paper must include more than simple literature review and compilation. Some aspect of *field work with data collection, map (topo, soils, hydrologic, geologic, etc.) interpretation, process measurement, quantitative observational data, or historical geomorphology/land use analysis* **must** be a component of the paper. All papers must present, analyze and discuss original data that you have collected; papers that do not will be hard-pressed to achieve a passing grade (50%). It is strongly suggested that the student discuss their paper topic with the professor early in the semester--as often as is necessary - to avoid avenues of research that are inappropriate or may prove to be inappropriate, unfruitful, too involved, too complex, or too simplistic. **ALL students must have a one paragraph (emailed) prospectus regarding your proposed paper topic to Dr. Schaetzl by April 1.** These prospectuses will be evaluated and can earn up to 5 bonus points, if well-done and thought-out. I will react and respond to your prospectus in an email or in person. Students are advised to incorporate the professor's comments and concerns into their study design. I will also be happy to examine and comment on ONE proofed draft of your complete paper, provided that it is typed (please type double-spaced so I can have space to write comments).

Your finished paper will be graded on several components (approximately as follows):

Research design and scientific method.....	40%
Neatness, grammar, spelling, writing style, etc...	30%
Quality of original data set.....	10%
Organization.....	10%
Imagination and creativity.....	10%

I will keep the paper you hand in; if you want a copy, please make one for yourself prior to handing it in. Please do NOT hand in papers with plastic-coated pages; it hinders my ability to write comments on the paper directly. I prefer papers to simply be stapled in the upper left corner; there is no need to dress them up in a fancy binder. Excessive length will not improve your grade, and may in fact detract from it. Quality matters more than quantity. Papers must be neatly typed, double-spaced, and all pages must be numbered. Spelling and grammar COUNT! Use of metric and Celsius units will be viewed favorably. All figures and tables should have a title/caption. References to at least some scholarly works MUST be included in your paper; use of your textbook as a reference is acceptable but additional citations will be expected. Use of lecture notes as a citation/reference is **not** acceptable. I suggest you use GEOREF or MAGIC2 or other e-search tools at the library to find sources of work similar to yours, which can be used a reference material. You may use any reference style that you wish, as long as you are *consistent*. Please **limit** the use of web pages as references to no more than one in four; URLs are generally not acceptable as citations in scientific papers, and thus are only barely acceptable in yours. If you do use web sites, provide the URLs of all the sites from which you may have gathered data or other information.

Make your paper look and be organized! I have found that the two most common sources of "point loss" for the papers in GEO 306 are (1) lack of appropriate subheadings (*e.g.*, Introduction, Literature Review, Methods, Study Area, Results, etc.), (2) improper referencing or lack thereof, (3) choice of a paper topic that is inappropriate, *e.g.*, no original data are gathered, and (4) no maps or figures are included for studies that would have benefitted from them. All information that is not "common knowledge" must be referenced appropriately. All papers must have a short but explanatory title page with your name, the date, etc. Examples of good papers completed by students from previous years are located on the "Courses Taught" section of my home page: http://www.geo.msu.edu/geo333/courses_taught.html Please also feel free to stop by my office to browse the huge stack of old papers that I have on hand.

I will be checking for plagiarism. If I find evidence of blatant plagiarism this will result in an automatic failing grade in the class and, potentially, dismissal from the University.

The paper must be handed in no later than 5:00 p.m. on the last day of lecture (April 29). Papers handed in after that date will lose 20 points per day. Obviously, this means that papers handed in five days (or more) late will receive a grade of zero, regardless of their content or quality. Exceptions are granted **only** in cases of extreme illness or extenuating circumstances.

Field Trips: There will be three field trips in GEO 306; each trip can accommodate 9 students. Bonus points are awarded for students that go on these trips (see below). In all cases, if more than 9 students want to go, the ones with the highest grade going into the trip will be included. For undergraduates, the trips are not required but strongly recommended. Trips are required for graduate students. Field trips are a very important part of this course; do not count yourself out for anything less than a very important conflict.

Trip 1: The Thumb and landscapes of Glacial Lake Saginaw: Saturday, April 18- *worth 5 bonus pts*

Trip 2: Northern Lower Michigan landforms, soils and glacial geomorphology: Friday-Sunday, Apr 24-26 - *worth 10 bonus pts*

Trip 3: SW Michigan interlobate region, and the Lake Michigan shoreline and dunes: Friday, May 1 - *worth 5 bonus pts*

To go on a trip, just email me and tell me which trip you are interested in attending. I will compile a list. If YOU withdraw from the list it will cost you 5 points, so be sure you are really “in” before you sign up. For all trips, the Geography Department will cover the cost of transportation. Lunches will be usually be eaten “on the run” from coolers; you will be expected to bring your own food. For the third trip, a 3-day, 2-night trip to the northern lower peninsula of Michigan, lodging and food costs will be covered by the students. We will cook dinners and breakfasts at a house where we will be staying (a beautiful place, on a small lake), to save money. This trip is open to the **first nine students who sign up and pay Dr. Schaetzl a non-refundable, partial payment of \$50 to cover lodging (a small balance will be due after the trip is over).**

GRADING:

A maximum of 300 points can be earned in this course. Grades are based on a curve of the student's *overall point total*. Points are assigned as follows:

First quiz.....	30 points
Second quiz.....	30 points
Third quiz.....	40 points
Final exam.....	100 points
Paper.....	100 points
Total:	300 points

As stated above, BONUS POINTS (Extra Credit) are available for students that (1) participate in field trips, and (2) get in a quality and acceptable term paper prospectus by Nov 1. Students with less than 150 total points will receive a grade of 0.0 - **no exceptions.**

RELATED COURSES

Several other, graduate and advanced undergraduate level, courses are offered at MSU; these courses are related in content to GEO 306. (Courses at the 100-300 level in many other disciplines may be helpful as well, but have been omitted for space purposes.) The courses below may be taken to advance your knowledge of a certain subject area(s) in physical geography and geomorphology. I would be happy to talk to you about these courses, if you have questions.

GEO 401: Geography of Plants of North America (offered this semester)

GEO 407: Regional Geomorphology of the United States (offered this semester, bt Dr Arbogast)

GEO 408: Soil Geomorphology Field Study (offered next fall, by me)

GEO 871: Seminar in Physical Geography (yes, undergrads can and do take 800-level courses)

(Offered this fall, by me)

FOR 409: Forest Hydrology

GLG 412: Glacial Geology and the Record of Climate Change (offered each spring by Dr Larson)

GLG 423: Survey of Environmental Geosciences

GLG 431: Sedimentology/Stratigraphy (offered this spring)

GLG 863: Mineral-Water Interactions

RD 201: Issues and Applications in Resource Development

CSS 210: Fundamentals of Soil and Landscape Science

CSS 470: Soil Resources

LECTURE OUTLINE

DATE	TOPICS	READINGS
Jan 12	Introduction, geomorphology and geomorphic surfaces, slopes	
Jan 14	Geomorphic concepts and models: Davis, King, Penck	330-333; 343-347; 352-354
Jan 19	No class - MLK day	
Jan 21	Geomorphic thresholds, systems theory	
Jan 26	Relative dating techniques: weathering and soil formation	
Jan 28	Numerical dating techniques: tephrochronology, ¹⁰ Be, ¹⁴ C and OSL	433
Feb 2	Numerical dating techniques, continued	
Feb 4	Rocks vs minerals, bedrock-controlled landforms	214-227; 355-358; 366-377
Feb 9	Bedrock-controlled landforms: I. Flat-lying and sedimentary folded rocks	
Feb 11	Bedrock-controlled landforms II. Faulted rocks, basin-and-range topography	348-351
Feb 16	Alluvial fans and bajada; catch up; QUIZ 1	
Feb 18	Vulcanism and volcanic landforms	246-280
Feb 23	Weathering and geomorphology	281-287
Feb 25	Soil horizons and formation, relative dating using soils	445-450; 455-457
Mar 2	Soil geomorphology, stone lines, pedimentation	
Mar 4	Paleopedology; catch up QUIZ 2	
Mar 9-13	SPRING BREAK	
Mar 16	Mass movement	287-297
Mar 18	Fluvial geomorphology: channel initiation and the drainage basin	298-300
Mar 23	Fluvial geomorphology: flow of water in the stream channel	300-304
Mar 25	Fluvial geomorphology: landforms and flooding	322-328; 334-342; 304-308; 328-329
Mar 30	Glaciation: introduction and landforms formed via glacial erosion; QUIZ 3	425-426; 433-434; 441-444
Apr 1	Glaciation: sediments and glacial deposits	427-432
Apr 6	No class, sorry	
Apr 8	Glaciation: depositional landforms	432; 434-436; 409-411
	Required lecture on April 9: Dr. Stephen Wolfe. At approx 4:00, probably in Rm 313 in Nat Sci Bldg.	
Apr 13	Glaciation: landforms and catch up	
Apr 15	Shorezones, shorelines and coastal processes	378-384
	Friday-Sunday, April 17-19 - Field Trip 2 - Northern lower Michigan landforms, soils and glacial geomorphology	
Apr 20	Coastal geomorphology and coastal systems	385-400
Apr 22	Coastal geomorphology: issues on the Great Lakes	
Apr 27	Karst and solutional landforms; caves	359-361
Apr 29	Eolian systems and the Great Lakes' dunefields	403-409
	Friday, May 1 - Field Trip 1 - The Thumb and the various landscapes of Glacial Lake Saginaw	
	Saturday, May 2 - Field Trip 3 - SW Michigan interlobate region; Lake Michigan shoreline and dunes	

OTHER IMPORTANT DATES

Apr 1	Last chance to email a one paragraph prospectus regarding your proposed paper topic to Dr. Schaetzl
Apr 29	Final papers due (in class)
May 5	FINAL EXAM (12:45-2:45)