Syllabus, GEO 432/532: Applied Geomorphology (3 credit hours)
Spring, 2008, Tues. & Thurs., 8:00-9:20 AM, Wlkn. 210 (Digital Earth)
Instructor: Stephen Lancaster (Assoc. Prof.), Wlkn. 142, 737-9258,
Stephen.Lancaster@geo.oregonstate.edu
Office hours: Tue., 9:30-10:20 AM; Thu., 1-1:50 PM

Course Description and Overview:

From the catalog: "Effect of landform processes upon human activity; consequences of resource management strategies on erosional balance within landscape; identification of mitigation of natural hazards; role of geomorphic process studies in environmental planning. Taught as seminar, themes TBA. Field trip(s) may be required; transportation fee charged.
"PREREQ: GEO 322"

The term, "applied geomorphology," can be interpreted to mean, "the techniques of geomorphology applied to real-world problems (i.e., things society cares about)." This course will emphasize the application of the geomorphological techniques to real-world problems. The course will focus on applied *fluvial* geomorphology.

Brief Course Outline:

I. Applied geomorphology overview
II. The big picture: Watersheds and channels
III. Agents of change: Fluvial processes
IV. Patterns and trajectories of change in fluvial systems
V. Putting it back together: some key issues and venues, problems and solutions

Communication with the Instructor:

The most reliable way to communicate with me is in person, preferably during my office hours. If you need to send me email, alert me so that I expect your message. In general, *you should not consider email or voice mail reliable for communicating with me!*

Instructional Objectives and Student Learning Outcomes:

Course Objectives:

The main objective of this course is to provide students with the tools, and the ability to use them, for addressing real-world problems in fluvial geomorphology. A subsidiary objective is to improve students' scientific report-writing skills.

Learning Outcomes:

Students should learn the following:

1. Techniques for geomorphic assessment of streams in the context of their watersheds and the application of those techniques.
2. Basic knowledge of fluvial forms and processes and likely changes resulting from those processes.
3. Knowledge of fluvial restoration and mitigation methods.
4. Use of qualitative and quantitative data in writing a report in the form of a scientific paper.

Assessment/Evaluation of Student Performance:

Summary of course requirements and credit:

GEO 432:

Quizzes, 5% each:	20%
Final exam:	20%
Reports for field trip #'s 1 & 2, 10% each:	20%*
Written group report for field trip #3:	20%*
Group presentation for field trip #3:	15%
Class and field participation:	5%
Total:	100%

GEO 532:

Quizzes, 4% each:	16%
Final exam:	16%
Reports for field trip #'s 1 & 2, 10% each:	20%*
Written group report for field trip #3:	20%*
Group presentation for field trip #3:	15%
Class and field participation:	5%
Presentations on supplementary reading:	8%
Total:	100%

*** You must turn in all three written reports in order to receive a passing grade. See the policy on late reports below.**

Quizzes:
Quizzes will be given in class, cover the material covered in the reading and lectures (including material covered by student presentations), and take 15 minutes each.

Final exam:
The final exam will be comprehensive and will also cover the reading and lecture material but will do so in more depth than the quizzes.

Field trips and reports:
There will be three (3) mandatory field trips during which you will apply some of what you learn in class. Handouts will help guide your field activity and writing. ***The reports will be due at the beginning of the class period on the due date***; see the schedule below for due dates. ***Late reports will be accepted up to one week following the due date, but 10% will be taken off for each business day or part thereof*** that it is late.

Field trip #3 will be the basis for written and oral group reports. Groups will consist of 3-4 students each. Group leaders will be chosen from among the GEO 532 students and will be responsible for assembling groups from the remaining students. Group presentations will be given during the last week of classes.

Class and field participation:
This is a hands-on class, so it is imperative that you show up prepared. You will be graded in part on your participation in class discussions and field trips (students who are particularly helpful in the field may receive extra credit). Students will begin the term with "80%" in this category. Their actions—or inactions—will dictate whether this score rises or falls over the course of the term.

Oral presentations on supplementary reading (GEO 532):
In addition to the other required reading, students enrolled for graduate credit must present the material for at least one of the supplementary readings to the class. (If extra readings are available, GEO 432 students may apply to make presentations for extra credit.) These presentations should be approximately 15 minutes long and will be graded on completeness, clarity, and time.

Learning Resources:

Texts for required reading:
Readings will be posted online and/or collected in a binder in Wlkn 208 (student lounge).

Readings will be drawn primarily from one book that you may wish to purchase (e.g., through the publisher or Amazon; it's become hard to find):

Applied Fluvial Geomorphology for River Engineering and Management, edited by Thorne CR, Hey RD, and Newson MD, John Wiley & Sons, New York, 1997, 376 pp. (***THN***)

Several readings will also be assigned from the following books:

River Channel Restoration: Guiding Principles for Sustainable Projects, edited by Brookes A, and Shields Jr. FD, John Wiley & Sons, New York, 1996, 433 pp. (***BS***)

River Ecology and Management: Lessons from the Pacific Coastal Ecoregion, edited by Naiman RJ and Bilby RE, Springer-Verlag, New York, 1998, 705 pp. (***NB***)

Rapid Evaluation of Sediment Budgets, Reid LM and Dunne T, Catena Verlag, Reiskirchen, 1996, 164 pp.

Supplementary texts you may wish to consult (available from instructor):
Julien, P.Y., *River Mechanics*, Cambridge University Press, Cambridge, 434 pp., 2002.

Bridge, J.S., *Rivers and Floodplains: Forms, Processes, and Sedimentary Record*, Blackwell Publishing, Oxford, 2003.

Knighton, D., *Fluvial Forms and Processes*, Oxford University Press, New York, 383 pp., 1998.

Leopold, L.B., M.G. Wolman, and J.P. Miller, *Fluvial Processes in Geomorphology*, Dover Publications, Inc., New York, 522 pp., 1964.

Computers/Online resources:
You will need to use computers and the class disk space to share and analyze data, and you may use the computers in Digital Earth. The course also uses Blackboard, where lecture notes, field trip handouts, and other resources are posted.

Outline, Readings, and Schedule:
Detailed Outline with Readings:

I. Applied fluvial geomorphology overview

Hey RD, River engineering and management in the 21st century, ***THN***, pp., 3-11.

*Naiman RJ, and Bilby RE, River ecology and management in the Pacific coastal ecoregion, ***NB***, pp., 1-10.

II. The big picture: Watersheds and channels

a. Watershed-scale effects:

Macklin MG, and Lewin J, Channel, floodplain and drainage basin response to environmental change, ***THN***, pp. 15-45.

*Reid LM, 1998, Cumulative watershed effects and watershed analysis, ***NB***, pp., 476-501.

b. Channel classification, scale issues:

Thorne CR, Channel types and morphological classification, ***THN***, pp. 175-222.

*Rosgen DL, 1994, A classification of natural rivers, *Catena*, *22*, 169-199.

*Kondolf GM, and Downs PW, Catchment approach to planning channel restoration, ***BS***, pp. 129-148.

c. Fluvial audits:

*Downs PW, and Thorne CR, 1996, A geomorphological justification of river channel reconnaissance surveys, *Trans. Inst. Brit. Geographers, 21*(3), 455-468.

Thorne CR, Allen RG, and Simon A, 1996, Geomorphological river channel reconnaissance for river analysis, engineering and management, *Trans. Inst. Brit. Geographers, 21*(3), 469-483.

*Fitzpatrick FA, 2001, A comparison of multi-disciplinary methods for measuring physical conditions of streams, in *Geomorphic Processes and Riverine Habitat*, Water Science and Application, Vol. 4, edited by Dorava JM, Montgomery DR, Palcsak BB, and Fitzpatrick FA, pp. 7-18, American Geophysical Union, Washington, D.C.

III. Agents of change

a. Open channel flow:

Bathurst JC, Environmental river flow hydraulics, ***THN***, pp., 70-93.

*Montgomery DR and Buffington JM, Channel processes, classification, and response, ***NB***, pp., 13-42.

b. Sediment dynamics:

Reid I, Bathurst JC, Carling PA, Walling DE, and Webb BW, Sediment erosion, transport and deposition, ***THN***, pp., 95-135.

*Sear DA, The sediment system and channel stability, ***BS***, pp. 149-177.

c. Bank erosion and stability:

Lawler DM, Thorne CR, and Hooke JM, Bank erosion and instability, ***THN***, pp., 137-172.

*Wallick JR, Lancaster ST, and Bolte JP, 2006, Determination of bank erodibility for natural and anthropogenic bank materials using a model of lateral migration and observed erosion along the Willamette River, Oregon, USA, *River Research and Applications* (in press).

IV. Patterns and trajectories of change in fluvial systems

a. Stable channel configurations:

Hey RD, Stable river morphology, ***THN***, pp., 223-236.

*Shields Jr. D, Hydraulic and hydrologic stability, ***BS***, pp. 23-74.

b. Styles of channel change:

Hooke JM, Styles of channel change, ***THN***, pp., 237-268.

*Jacobson RB, 1995, Spatial controls on patterns of land-use induced stream disturbance at the drainage-basin scale—an example from gravel-bed streams of the Ozark Plateaus, Missouri, in *Natural and Anthropogenic Influences in Fluvial Geomorphology: The Wolman Volume*, edited by Costa JE, Miller AJ, Potter KW, and Wilcock PR, pp. 219-239, Geophysical Monograph No. 89, American Geophysical Union, Washington, D.C.

c. Channel changes and unstable channel geometries:

Richards KS, and Lane SN, Prediction of morphological changes in unstable channels, ***THN***, pp., 269-292.

*Larsen EW, and Greco SE, 2002, Modeling channel management impacts on river migration: A case study of Woodson Bridge State Recreation Area, Sacramento River, California, USA, *Environmental Management, 30*(2), 209-224.

V. Putting it back together: some key issues and venues, problems and solutions

a. Restoration:

Brookes A, and Sear DA, Geomorphological principles for restoring channels, ***BS***, pp. 76-101.

Brookes A, Baker J, and Redmond C, Floodplain restoration and riparian zone management, ***BS***, pp. 201-229.

*Frissell CA and Ralph SC, Stream and watershed restoration, ***NB***, pp., 599-624.

*Pacific Northwest Ecosystem Research Consortium, 2002, *Willamette River Basin Planning Atlas: Trajectories of Environmental and Ecological Change*, 2nd Ed., Oregon State University Press, Corvallis, pp. 131-147 (Ch. 8, Restoration), oregonstate.edu/Dept/pnw-erc/.

b. Mitigation of erosion and sedimentation problems:

Brookes A, River dynamics and channel maintenance, ***THN***, pp., 293-307.

*Johnson PA, Hey RD, Tessier M, and Rosgen DL, 2001, Use of vanes for control of scour at vertical wall abutments, *Journal of Hydraulic Engineering*, *127*(9), 772-778. (and discussion & closure, 2003)

c. Sediment budgets

Reid LM and Dunne T, *Rapid Evaluation of Sediment Budgets*, pp. 1-24, 60-61, 124-130 (Ch. 1, 2, excerpts from Ch. 3, 4, 5).

*Reid LM and Dunne T, *Rapid Evaluation of Sediment Budgets*, pp. 20-60 (Ch.3, Evaluating sediment production from hillslopes and channels).

*Reid LM and Dunne T, *Rapid Evaluation of Sediment Budgets*, pp. 60-124 (Ch 4, Evaluating sediment transport and storage in channels).

d. Practice:

Newson MD, Hey RD, Bathurst JC, Brookes A, Carling PA, Petts GE, and Sear DA, Case studies in the application of geomorphology to river management, ***THN***, pp., 311-363.

* Supplementary readings to be assigned to students enrolled in GEO 532 for in-class presentations (GEO 432 students may “apply” for these assignments for extra credit).

Geo432/532 Spring 2008 Schedule (T Th, 8:00 - 9:20 PM, WLKN 210)

Student presenter	DATE	Class Meeting Topic	Activity/Due	Read
—	1-April	1. Applied fluvial geomorph. overview		I
	3-April	2. Watershed-scale effects		II.a.
	8-April	3. Channel classification		II.b.
	10-April	4. Fluvial audits		II.c.
	15-April	5. Open channel flow	**Quiz**	III.a.
	17-April	6. Sediment dynamics & FT #1 brief		III.b.
	19-Apr	**Field trip: fluvial audit of local streams, 8 am – 6 pm[1]**		
—	22-April	7. Post-field trip debrief		
	24-April	8. Bank erosion & stability	**Guest speakers**	III.c.
	29-April	9. Stable channel configurations	**Quiz**	IV.a.
	1-May	10. Channel change styles & FT#2 brief	**FT#1 report**	IV.b.
	3-May	**Field trip: local fluvial processes, 8 am – 6 pm[1]**		
—	6-May	11. Post-field trip debrief		
	8-May	12. Unstable channel changes		IV.c.
	13-May	13. Restoration	**Quiz**	V.a.
	15-May	14. Restoration & FT#3 brief	**FT#2 report**	V.a.
	17-May	**Field trip: local restoration project, 8 am – 6 pm[1]**		
—	20-May	15. Post-field trip debrief		
	22-May	16. Channel maintenance		V.b.
	27-May	17. Sediment budgets		V.c.
—	29-May	18. Pre-presentation brief	**Group time, Quiz**	
	3-June	19. Group presentations		
	5-June	20. Group presentations	**FT#3 report**	
	12-Jun	**(Thursday) Final Exam, 9:30-11:20 AM, WLKN 210**		

[1] Field trips may not take all of this time.

University and Departmental Policies:

Students with Disabilities: "Students with documented disabilities who may need accommodations, who have any emergency medical information the instructor should know, or who need special arrangements in the event of evacuation, should make an appointment with the instructor as early as possible, no later that the first week of the term. In order to arrange alternative testing, the student should make the request at least one week in advance of the test. Students seeking accommodations should be registered with the Office of Services for Students with Disabilities."

Rules on Civility and Honesty: The Department of Geosciences follows the university rules on civility and honesty. These can be found at http://oregonstate.edu/instruct/cssa556/CIVHON556.htm.

Cheating or plagiarism by students is subject to the disciplinary process outlined in the Student Conduct Regulations. Students are expected to be honest and ethical in their academic work. Academic dishonesty is defined as an intentional act of deception in one of the following areas:

* cheating- use or attempted use of unauthorized materials, information or study aids
* fabrication- falsification or invention of any information
* assisting- helping another commit an act of academic dishonesty
* tampering- altering or interfering with evaluation instruments and documents
* plagiarism- representing the words or ideas of another person as one's own

Student Collaboration: You are allowed and encouraged to work together on the reports for field trip #'s 1 & 2, but there are strict limits to that cooperation. (1) You must cite all your sources of information, both written and oral, and failing to do so constitutes academic dishonesty. Since it is sometimes difficult to sort out who said what in a discussion setting, you may acknowledge such discussion broadly (e.g., "I discussed this assignment with Jane Doe and John Smith."). Specific pieces of information that are directly attributable to another person or written work must be cited (e.g., "Lancaster told those on the field trip that…(John Smith, personal communication)"). (2) Citation is not a substitute for doing your own work. For example, turning in a paper that contains nothing but cited information (e.g., "I copied the entire assignment from Jane Doe's work."), while not academically dishonest, would be unsatisfactory and result in zero credit. (3) Finally, discussion alone does not result in work that is nearly identical in appearance to the work of another student. Two papers should not, for example, show nearly identical drawings.

In general, if you are in doubt ask the instructor and/or err on the side of too much citation and refraining from what might give the appearance of academic dishonesty.

Other: Behaviors disruptive to the learning environment will not be tolerated and will be referred to the Office of Student Conduct for disciplinary action.