

GEO449/549: Fluvial Geomorphology

Course Information and Syllabus, Spring 2014

Schedule: TR, 12:30-1:50 pm

Location: 106 Wilkeson

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Instructor: Dr. Sean J. Bennett

Office: 126 Wilkeson Quad

Office Hours: TR 2:00-3:00 pm

Course Description: The course examines the classic themes in fluvial geomorphology including channel hydraulics, sediment transport, dominant discharge, hydraulic geometry, regime theory, channel patterns, river networks, and river channel change, as well as emerging including models and prediction, riverine habitat and riparian vegetation, and stream corridor restoration.

Course Learning Objectives and Assessment Instruments

<i>Number</i>	<i>Program Learning Outcome</i>	<i>Depth*</i>	<i>Specific outcome objectives for GEO549</i>	<i>Assessment instrument</i>
1	Provide breadth of knowledge of basic principles and concepts	2	Students will learn about the classic themes in fluvial geomorphology as well as emerging topics in the discipline	Seminars and Project
2	Provide depth within specialized areas	2	Learn and master the fundamentals of fluid flow, boundary layers, and sediment transport in rivers	Student-presented Seminars
			Learn and master the fundamentals of hydraulic geometry, river channel pattern, and bank erosion	
			Learn and master the fundamentals of river channel change and catchment processes	
			Learn and master the theory of stream restoration and the use of models in fluvial geomorphology	
3	Provide an understanding of experimental/research design and methodology	2	The scientific method will be presented and consistently applied in each written assignment	Seminars and Project
4	Develop approaches for integration of information	2	Students must conduct an independent project that entails the collection of data, the reduction and analysis of previously collected data, the testing of new hypotheses, and/or the formulation or application of conceptual or numerical models	Project
5	Encourage critical thinking and hypothesis building	2	Students will learn to critically assess published literature, as well as the collection, reduction, and presentation of their own data	Seminars and Project
6	Provide skills in writing and communication	2	Each student will be required to write two (2) short and one (1) long paper, and present two (2) seminars	Seminars and Project
7	Provide contemporary information	2	All student seminars are based on recently published literature, selected to align with the theme presented in class	Seminars
8	Encourage appreciation of scientific values	2	Apply the basic principles of physics, river hydraulics, open channel flow, and geotechnical engineering to the collection, processing, analysis, and presentation of data	Project

*Depth: 0 - not covered; 1 - moderately covered; 2 - extensively covered

SYLLABUS

Date	Topic	Assigned Reading	Assignment Due
<i>Part 1: Flow and Sediment Transport in Rivers</i>			
1/28	Fluid Flow and Boundary Layers I	B: 17-43; K: 96-107	
1/30	Fluid Flow and Boundary Layers II	B: 17-43; K: 96-107	
2/4	Incipient Motion	B: 44-54; K: 107-113	
2/6	<i>Seminar on Turbulent Flow and Incipient Motion</i>		Seminar presentations
2/11	Sediment Transport Mechanics I	B: 55-77; K: 118-141	
2/13	Sediment Transport Mechanics II	B: 55-77; K: 118-141	
2/18	Bedforms and Flow Resistance	B: 78-140; K: 187-205	
2/20	<i>Seminar on Sediment Transport, Bedforms, and Flow Resistance</i>		Seminar presentations
<i>Part 2: River Channel Form and Process</i>			
2/25	Hydraulic Geometry and Regime Theory	B: 165-177; K: 167-187	
2/27	Alluvial Channel Patterns I	B: 141-204; K: 205-241	
3/4	Alluvial Channel Patterns II	B: 141-204; K: 205-241	
3/6	<i>Seminar on Hydraulic Geometry and Alluvial Channel Pattern</i>		Seminar presentations
3/11	Flow in a Meandering Channel	B: 141-204; K: 205-241	
3/13	Mechanics of Bank Erosion	K: 113-118	
3/18	NO CLASS		
3/20	NO CLASS		
3/25	Confluences and Networks	B: 177-188; K: 55-64	
3/27	<i>Seminar on Meandering Channels, Bank Erosion, Confluences, and Networks</i>		Seminar presentations
4/1	Longitudinal Profiles and Downstream Fining	B: 296-297; K: 242-260	
4/3	Sediment Yield	B: 7-13; K: 65-95	
<i>Part 3: Adjustments and Prediction of the Fluvial System</i>			
4/8	Fluvial Geomorphology and Vegetation		
4/10	<i>Seminar on Longitudinal Profiles, Sediment Yield, and Vegetation</i>		Seminar presentations
4/15	Adjustments of the Fluvial System	B: 13-16; K: 261-335	
4/17	River Restoration		
4/22	Conceptual and Numerical Models I		
4/24	Conceptual and Numerical Models II		
4/29	<i>Seminar on River Channel Change, Restoration, and Fluvial Models</i>		Seminar presentations
5/1	<i>Term Project Presentations</i>		Project presentations
5/6	<i>Term Project Presentations</i>		Project presentations
5/8	<i>Term Project Presentations</i>		Project presentations
5/16			Term Project

Recommended Textbooks:

Rivers and Floodplains: Forms, Processes, and Sedimentary Record, by John S. Bridge, 2003, Blackwell Publishing, 491 pp., (ISBN: 9780632064892, ISBN10: 0632064897; denoted as **B** above).

Fluvial Forms and Processes: A New Perspective, by David Knighton, 1998, Arnold, 383 pp., (ISBN: 9780340663134, ISBN10: 0340663138; denoted as **K** above).

Resources: All students are encouraged to secure copies of the textbooks. All graphics shown in class will be posted on Ublearns in PDF format.

Course Evaluation: Two (2) seminars, one (1) term paper presentation, and one (1) written term paper per student, plus class participation.

Topical seminars will comprise students choosing a recently published journal paper and presenting it to the class. These papers must be (1) pre-approved by the instructor, (2) published after 2011 in an approved journal (see list below), and (3) related to the topic theme. Failure to adhere to any one of these criteria will result in a "0" grade.

Each seminar day will include up to six (6) student presentations, with ~10 minute allotment per presentation and an additional 2 minutes for discussion (12 minutes total). A computer with projector will be available for student use. In addition, each student presenter must prepare a 250-word abstract of the chosen paper, written in their own words. Attending and participating in seminars, including asking questions of the presenter, is mandatory. No abstracts will be accepted after seminar presentation.

Each seminar will be worth 15 points, subdivided as follows: 10 points for scientific content and delivery; 2 points for abstract quality; 2 points for seminar format and organization; and 1 point for time management.

The term paper is a relatively long discussion (~20 pages long, 12-point font, and single-spaced in addition to figures, tables, and references) of a topic, focusing on the critical evaluation of the subject. This paper must entail the collection of data (field, experimental, synthetic, or survey; quantitative or qualitative), the reduction and analysis of previously collected data, the testing of new hypotheses, and/or the formulation or application of conceptual or numerical models. It also should include a literature review, identified gaps in current knowledge, and insight into new research opportunities. Plagiarism or the submission of work not your own will result in “0” grade. Topics must be approved by the instructor. No papers will be accepted after due date.

The term paper will be worth 45 points, subdivided as follows: 30 points for scientific content; 10 points for writing quality; and 5 points for format, references, and citations.

Class participation includes asking and answering questions during class lectures and seminars, and this will be worth 10 points.

Grades: Below is a table of all required work, deadlines, and the percentage points for student evaluations. Normal university grading procedures will be employed. I reserve the right to add a few percentage points to every student’s final grade.

Required Work	Date Due	% of Total Grade
Seminar Presentations (2)	TBA	15% each (30% total)
Term Paper Presentation (1)	TBA	15%
Term Paper	4:30 pm, 5/16	45%
Class Participation	NA	10%

Academic Integrity: All students should read and adhere to UB’s Academic Integrity Policies and Procedures, <http://grad.buffalo.edu/Academics/Policies-Procedures/Academic-Integrity.html>

General Guidelines for Seminars:

- All papers must be published after 2011 in an approved journal (see below; no other journals will be accepted), and these must be related directly (not tangentially) to the seminar theme
- Students will present seminars standing in front of the class
- Students are allotted ~10 minutes per presentation, with an additional 2 minutes for questions; do not run over time
- Format should be restricted to ~8 to 12 PowerPoint slides, focused on the main points of the paper—title and author(s), main ideas, hypotheses or objectives of the paper, select observations, plots, graphs, or mathematical formulations, and concluding statements or summary
- Ensure all visual equipment is secured, in place, and working properly with the intended presentation
- Rehearsing the presentation is strongly recommended
- “Less” is generally “more”
- Speak to the audience and not the screen, use a relaxed, confident, and authoritative tone, make eye contact with the audience, and minimize body gestures and reading from notes
- Listen to the questions, and respond in a courteous, relaxed manner
- Respect each other at all times
- Students will be evaluated on the clarity, style, format, and professionalism of their presentation, their command of the topic, the effectiveness of the visual aids, and their time management

- Abstracts will be assessed for the quality of the writing and the efficacy in communicating the main points of the paper in 250 words
- Attendance and participation by all students is mandatory

General Guidelines for Papers:

- Papers should have the following headings: Abstract (250-word maximum), Introduction (with objectives of the paper), Methods (if applicable), Results, Discussion, Conclusions, and References
- Papers will be assessed for content, accuracy, originality, presentation, organization, and overall quality of the writing
- Write concisely, much like a journal paper
- Keep observations, measurements, and results separate from discussion and interpretations
- Use your own voice; plagiarism will not be tolerated
- All figures and tables require a caption
- Equations should be numbered sequentially in order of appearance, and all variables defined
- All material presented must be accurately and correctly cited, and references should follow the style and format of the American Geophysical Union

List of approved scientific journals for seminar papers:

Advances in Water Resources
 Earth Surface Processes and Landforms
 Geological Society of America Bulletin
 Geomorphology
 Hydrological Processes
 Journal of the American Water Resources
 Association
 Journal of Fluid Mechanics

Journal of Geophysical Research-Earth Surface
 Journal of Hydraulic Engineering
 Journal of Hydraulic Research
 Journal of Hydrologic Engineering
 Journal of Hydrology
 River Research and Applications
 Sedimentology
 Water Resources Research