CIVE 413 – Environmental River Mechanics
Fall 2014

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Required Texts: Knighton, A.D. 1998. *Fluvial Forms and Processes*. Arnold Publishers. (purchase - available in bookstore)

Richardson, E.V., D.B. Simons, P.F. Lagasse. 2001. *River Engineering for Highway Encroachments: Highways in the River Environment*. Federal Highway Administration, Report No. FHWA NHI 01-004 HDS-6. (free - download from next link below)

Course Home Pages: http://www.engr.colostate.edu/~bbledsoe/CIVE413/
and through RamCT at https://ramct.colostate.edu/

Office Hours: Tuesdays 1:30-3:00 and Thursdays 1:30-2:30 in Engineering A205E or by appointment

Course Description: Fluvial geomorphology, sediment transport, and river response with special emphasis on environmental aspects. Technical communication across the fields of river hydraulics / mechanics, fluvial geomorphology, water quality management, and aquatic ecology is emphasized. Survey of water quality and quantity issues related to the management of rivers, streams, riparian areas, floodplains, watersheds, and aquatic ecosystems. Students are introduced to standard hydraulic and sediment transport models.

Learning Objectives

1. Describe stream and river behavior and response to alterations across different spatial and temporal scales using quantitative and qualitative models
2. Apply standard mathematical and computational models of fluvial processes, including HEC-RAS and standard sediment transport relationships
3. Design stable channels with varying capacities to transport sand and gravel/cobble materials (longitudinal profile, planform, and cross-section)
4. Understand and be conversant in describing interactions between physical and ecological processes in streams and rivers
5. Gain perspective through case studies that involve balancing consumptive demands and stewardship of rivers in an atmosphere of scientific uncertainty
6. Improved speaking, writing, and critical thinking skills in the context of interdisciplinary water resources issues
7. Exposure to the primary scientific literature and current themes in river research

Grading System:

Two 75 Minute Exams	25 %
Homework	30 %
Reading Quizzes	15 %
Field Trip & HEC-RAS Lab	10 %
Final Exam	20 %

Exams:	Exam 1	October 14
	Exam 2	November 18
	Final Exam	Monday, Dec. 15th, 11:50-1:50

Essential Computer Skills: Spreadsheets (formulas / Solver), word processing, web browser

Lab Session: A ~3-hour computer lab (to be scheduled in class) will be held to familiarize you with HEC-RAS and stable channel design programs. Basic knowledge of these programs will be essential for successful completion of homework assignments later in the course.

Field Trip to the Cache la Poudre: A Saturday field trip (to be scheduled in class) will be held to provide you with an opportunity to observe physical and biological characteristics and processes in and around the Cache la Poudre River (and possibly Spring Creek), to apply concepts from class, and to improve analysis and communication through teamwork.

Reading assignments and quizzes: I will endeavor to make this a discussion-oriented course. For this approach to be meaningful and effective, it is essential that you read material as it is assigned prior to our class discussions. To encourage you to do this, I will give several short quizzes throughout the semester to assess whether the reading assignments are being completed and comprehended. You will be able to drop a few of your lowest quiz scores or missed quizzes from your quiz grade. In addition to assigned readings in the text, there may be additional readings that we will be discussing and critiquing during the semester. Reading assignments and quiz dates will be announced well in advance.

Policies: Homework submissions must be prepared in accordance with the guidance posted on RamCT. I will accept late homework submissions up to five days after the due date or before solutions are distributed, whichever comes first. A **penalty of 20% per day** late will be assessed on these assignments. Make-up exams will be given only for university-approved excuses or when you have a note from a medical professional. Please turn off cell phones in the classroom. I will respond to emails written in a professional style (including salutation and attention to correct grammar and spelling). I encourage students to discuss and collaborate on homework and other outside assignments but the final work you turn in should be distinctly your own. The course will adhere to the Academic Integrity Policy of the Colorado State University General Catalog (Page 7) and the Student Conduct Code. CSU policies on academic integrity will be rigorously enforced in this course. Please examine the following references on academic integrity:
http://tilt.colostate.edu/integrity/honorpledge/
http://tilt.colostate.edu/integrity/faqs/what_are_rules.cfm
http://tilt.colostate.edu/integrity/resources/forstudents.cfm

In accordance with CSU policies, I ask that you include and sign the following statement on all written work: "I pledge on my honor that I have not given, received, or used any unauthorized assistance. _____(signature)"

Tentative Outline of Topics:

Introduction to Environmental River Mechanics

Hydraulics and Hydrology Refresher (varies depending on class familiarity)

- Types of flow
- Velocity profiles
- Roughness / bedforms
- Drainage networks
- Hydrographs
- Recurrence intervals

Erosion and Sedimentation

- Incipient motion
- Modes of sediment transport
- Supply vs. capacity
- Sediment transport equations
- Sediment rating curves

Fluvial Geomorphology

- Fluvial system
- Planform relationships
- Bankfull and effective discharges
- Hydraulic geometry
- Stream classification
- Stream and river response

River Mechanics and Stable Channel Design

- Regime relationships
- Analytical solutions
- Geotechnical considerations
- Bank stabilization techniques
- HEC-RAS – Copeland's stable channel design method

Applied Aquatic Ecology/Water Quality

- River continuum / discontinuum / mosaic concepts
- Natural flow regime / environmental flows
- Physical, chemical and biological aspects of water quality
- Physical habitat
- Sediment impacts on biota
- Biomonitoring / indicators of ecosystem integrity

Management and Restoration of Streams and Watersheds

- Water policy
- Riparian areas, wetlands, and floodplains
- Basic concepts and tools
- Strategic vs. tactical restoration
- Watershed analysis

Potential Case Studies:

- Watershed urbanization
- Eagle River and Camp Hale
- Little Snake River restoration
- Cache la Poudre River – flow regime
- Ten Mile Creek – restoration
- Platte River Recovery Program
- San Juan River Recovery Program
- Arkansas River below Leadville