COURSE OUTLINE

COURSE: Geography 201 – Fluvial Geomorphology
Lectures: M & W STC 0060  2:30 – 3:50 PM

INSTRUCTOR: Dr. M. Stone
Room 112 – ENV1
Office Hours: T (1:00 - 3:00 PM)

TAs TBA

Course Description:
Fluvial geomorphology is the scientific study of river landforms and the processes that create them. A working knowledge of fluvial geomorphology has important practical environmental science and management applications and is relevant to many other fields of environmental enquiry such as environmental engineering, watershed planning, source water protection, forestry and risk management.

This course will examine a range of physical and chemical processes that create micro and macro-scale landforms over a range of spatial and temporal scales. Implications of these processes for environmental management in the context of environmental change will be considered.

Course Goals:

- To provide an understanding of fundamental earth surface processes that create fluvial landforms
- To understand the relevance of fluvial geomorphology to other fields of environmental enquiry i.e. environmental engineering, planning, soil science, hydrology, sediment transport, water quality, water resources management.


Evaluation:
2 Quizzes - Drop lowest grade  30%
3 Labs @ 10% each  30%
Final Exam  40%
Class Schedule

Sept 12  Course Introduction (Chapter 1)
          Why study rivers?

Sept 14  The Fluvial System (Chapter 2)
          Inputs, outputs and storage
          Types of systems
          Fluvial system variables
          Feedback and thresholds
          Spatial and temporal scales
          Concept of equilibrium
          Feedback, thresholds and equilibrium – Southern Rockies case study

Sept 19  River basin characteristics

Sept 21  Film: Rivers of Destiny

Sept 26  Flow regime (Chapter 3)
          Flow generation and hydrological pathways
          Hill slope hydrology
          Storm hydrograph and drainage basin response
          Measurement of flow in streams
          Lab 1 Drainage basin characteristics and river discharge

Sept 28  Flow regime (Chapter 3)
          Floods
          Bankfull discharge
          Flood magnitude and frequency
          Regional flood frequency curves

Oct  3  Sediment sources (Chapter 4)
          Weathering and mass wasting processes

Oct  5  Sediment sources (Chapter 4)
          Hillslope erosion
          Rain splash and sheet wash erosion
          Rills and gullying
          Monitoring rates of erosion
          Soil erosion models

Oct 10  Thanksgiving

Oct 12  Large scale sediment transfer (Chapter 5)
          Sediment transfer
          Sediment transfer from hillslopes
          Modes of sediment transport in rivers
          Sediment Yield
          Sediment storage and delivery ratio
          Controls on sediment yield
Oct 17  Large scale sediment transfer (Chapter 5)
    Coarse sediment transfer and yield
    Sediment budgets
    Human activity and sediment yields
*Lab 2 Sediment transport processes*

Oct 19  Flow in channels (Chapter 6)
    Flow in river channels
    - Driving and resisting forces
    - Channel parameters
    - Flow velocity and variations
    Concept of flow continuity

Oct 24  Quiz 1

Oct 26  Flow in channels (Chapter 6)
    Flow, channel and boundary resistance
    Flow behavior
    - Subcritical, critical and supercritical flow
    - Laminar and turbulent flow
    - Boundary layer
    - Bed shear stress

Nov 2   Erosion, transport and deposition processes (Chapter 7)
    Concept of stream power
    - Work, energy and stream power
    Erosion in bedrock channels
    Erosion in alluvial channels

Nov 7   Erosion, transport and deposition processes (Chapter 7)
    Sediment entrainment and transport
    Bedload Transport
    Suspended load transport
    Sediment supply and transport rates
    Depositional environments

Nov 9   Channel form and behavior (Chapter 8)
    Controls on channel adjustment and form
    - Driving variables
    - Sediment regime
    - Stream power vs sediment supply
    Boundary conditions
    Channel adjustments

Nov 14  Channel form and behavior (Chapter 8)
    Hydraulic geometry relationships
    Channel geomorphic units
    Floodplain morphology

Nov 21  Channel form and behavior (Chapter 8)
    Alluvial channel form
Straight and meandering channels
Braided channels
Anabranching channels
Anastamosing channels
Mixed bedrock and alluvial channels

Lab 3 River channel change

Nov 23  System response to change (Chapter 9)
Nature of change
   Allogenic vs autogenic
   Types of disturbance
   System response
Sensitivity to change
   Functional Flows

Nov 28  Quiz 2

Nov 30  System response to change (Chapter 9)
Response to fluvial systems to change
   Extreme floods
   Wildfire
   Human activity
   Tectonics and base level change

Dec 5  Managing River Channels I (Chapter 10)
Traditional Engineering Techniques
Channelization and flow regulation techniques
Environmental degradation

Note:
The labs will be assigned on Sept 26, Oct 17 and Nov 21. They will be introduced in class by the instructor. Completed labs will be due in class one week after they have been assigned. The penalty for late submission is a reduction of 10 %/day.
Supplementary References


**Plagiarism** is defined as taking “intellectual property,” such as words, drawings, photos, or artwork, etc., written or created by others, and passing it off as your own. When you submit a report or assignment with your name on it, it is assumed that you are the author of everything in the assignment except for those materials that are specifically identified as coming from other sources. Therefore, if you include sentences, photos, drawings or figures from other sources in a work report or lab report, the complete reference must be cited. This applies in particular to any material cut-and-pasted from the internet or any other electronic source. Failure to cite the source completely is plagiarism, an academic infraction with serious consequences under *University of Waterloo Policy 71*.

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**Grievance:** A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70 - Student Petitions and Grievances, Section 4, [http://www.adm.uwaterloo.ca/infosec/policies/policy70.html](http://www.adm.uwaterloo.ca/infosec/policies/policy70.html)

**Discipline:** A student is expected to know what constitutes academic integrity, to avoid committing academic offenses, and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offense, or who needs help in learning how to avoid offenses (e.g., plagiarism, cheating) or about “rules” for group work/collaboration should seek guidance from the course professor, academic advisor, or the Undergraduate Associate Dean. When misconduct has been found to have occurred, disciplinary penalties will be imposed under Policy 71 – Student Discipline. For information on categories of offenses and types of penalties, students should refer to Policy 71 - Student Discipline, [http://www.adm.uwaterloo.ca/infosec/Policies/policy71.html](http://www.adm.uwaterloo.ca/infosec/Policies/policy71.html)

**Appeals:** A student may appeal the finding and/or penalty in a decision made under Policy 70 - Student Petitions and Grievances (other than regarding a petition) or Policy 71 - Student Discipline if a ground for an appeal can be established. Read Policy 72 - Student Appeals, [http://www.adm.uwaterloo.ca/infosec/Policies/policy72.html](http://www.adm.uwaterloo.ca/infosec/Policies/policy72.html)