RIVER CLASSIFICATION

Example Syllabus

Instructor: Dr. Theodore Endreny, 423 Baker Labs, te@esf.edu, 315-470-6565
Course Meeting: Tuesdays 12:30-3:20 Field or Lab (N.B. field van may return > 4pm)
Course Web Page: Materials maintained at blackboard.syr.edu

Course Description

This course introduces form and process based river classification techniques, and implements the Rosgen classification as a field exercise. Classification is conducted through measurement and interpretation of river profile, pattern, dimension, and substrate. Investigations use laboratory work with maps and photographs to extract information on valley type and watershed characteristics. Field exercises provide site sketches, photographs, and survey data to reveal 1) the profile of bed, water, and bankfull slopes, 2) the pattern of meanders and belt width, 3) the dimension of cross sections at steps / riffles and pools, and 4) sediment surveys at cross sections and throughout longitudinal profiles. Data are used to interpret river processes, stability, and possible departure. Analysis of river geometry and peak flow data are used to complement the classification. Students complete readings in channel evolution, degradation, and restoration issues. ERE 612 students will have additional readings and assignments, resulting in a 15 page paper.

Course Text & Materials

Required:

- *Stream Channel Reference Sites: An Illustrated Guide to Field Technique*. Harrelson, Rawlins, & Potyondy, USDA Report RM-245 (free PDF)
- *Stream Restoration: A Natural Channel Design Handbook*. Doll, Grabow, Hall, Halley, Harman, Jennings, and Wise, NC Stream Restoration Institute (free PDF)
- *Fluvial Form & Processes 2nd Edition*, Knighton AD, Arnold Pubs, 1998.
- *Waders, calculator, field notebook/device, and weather appropriate clothing*

Optional Additional Resources:

- *The Reference Reach Field Book*. Leopold, Silvey, Rosgen, Wildland Hydrology
- *Fluvial Processes in Geomorphology*. Leopold, Wolman & Miller. Dover Pubs.
- *Applied River Morphology*. Rosgen, Wildland Hydrology.

Agenda for Class & Laboratory

Week 1. Introduction to course. Fluvial geomorphology terms. Classification systems. Begin map and photo analysis techniques. Lab 1 assigned.
Week 2. Geomorphology field tour of site. Establish monument, benchmark & site sketch. Work survey equipment skills. Measure several bankfull channel widths to guide subsequent surveys.
Week 3. Field: Cross sectional characterization (weather dependent). Sediment transport theory and exercises. Lab 2 assigned.
Week 4. Field: Complete cross sectional characterization (weather dependent), discuss and explore assessment and monitoring methods for sediment transport and bank stability.
Week 5. Field: Longitudinal characterization (weather dependent). Sediment transport theory and exercises. Lab 3 assigned.

Week 6. Field: Complete longitudinal characterization (weather dependent), discuss and explore assessment and monitoring methods for sediment transport and bank stability.
Week 7. Field: Substrate characterization (weather dependent). Sediment transport theory and exercises. Lab 4 assigned.
Week 8. Field: Complete substrate characterization (weather dependent), discuss and explore assessment and monitoring methods for sediment transport and bank stability.
Week 9. Field: Pattern characterization and mapping of sinuosity and curvature (weather dependent). Sediment transport theory and exercises. Lab 5 assigned.
Week 10. Field: Channel classification and evolution. Lab 6 assigned. Demonstrate and apply assessment and monitoring methods for sediment transport and bank stability.
Week 11. Field: Channel departure and natural channel design. Lab 7 assigned. Demonstrate and apply assessment and monitoring methods for sediment transport and bank stability.
Week 12. Field: Complete channel departure and natural channel design. Sediment transport theory and exercises.
Week 13. Geomorphological dimensions from flow surveys. Lab 8 assigned
Week 14. Flow frequency analysis from flow surveys. Lab 9 assigned
Week 15. Class summary and student reports.

Learning Outcomes

At the end of this course, the student should be able to:

1. Survey and interpret valley type, channel profile, pattern, dimension, and substrate characteristics from maps, photos and field visits;
2. Describe anthropogenic and geomorphic processes leading to instability and classification departure, and use reference reach method to design restoration;
3. Utilize common river flow measurement data to construct hydraulic geometry and flow frequency analyses;
4. Apply knowledge of mathematics, science, and engineering to solve river classification engineering problems (a, e);
5. An ability to design a river restoration system, component, or process to meet desired goals (c);
6. An ability to function on a multi-disciplinary team and an understanding of professional and ethical responsibility (d, f);
7. An ability to communicate effectively and understand the impact of engineering solutions in a global and societal context (g, h);
8. A recognition of the need for, and be able to engage in, life-long learning and knowledge of contemporary river engineering issues (i, j); and
9. An ability to use the techniques, skills, and modern engineering tools necessary for river engineering practice (k).

Assignments (Percent of Grade)

Laboratory (65): 9 properly formatted lab reports and presentation of results;
Exams (30): 1 mid-term examination; 1 final-examination.
Participation (5): Regular participation in class;
Evaluation is as follows: The quality of your work will be based on restating problem goal, presenting and referencing all pertinent data, application of appropriate computations, completeness, supporting material, organization, and correct answers. Design requires 2 incremental drafts of design report and 1 approved and final design report.

Class Policy

1. Laboratory assignments are due within 48-hrs of completion of the field data collection. Ten points are taken for 1 day late, 20 points for 2 days late, and 50 points for 3 days late. This policy ensures data review while the data are fresh, and feedback before you transition to the next stage of data collection.
2. Departure for the field will be punctual to ensure we have time needed for field work. If you miss the vehicle, try to get to the site on your own. Your lab partner will likely need your help.
3. Equipment is likely fragile and expensive, so please treat it with care and respect. Your help moving the equipment to the vehicle, to the site, and back is needed.
4. Discussion may not cover all reading material, yet the students should seek to understand all assigned material.
5. Needs for note-taking accommodations should be met - discuss this with me or appropriate ESF personnel. Students must work independently on written assignments.