DETAILED COURSE DESCRIPTION

COURSE:  ERE 412 – River Form and Process  
3 Credit Hours – Fall Semester  
3 Hours Lecture Per Week  
Prerequisite(s): ERE340, ERE371, APM395

SCOPE:

1. *Level of Instruction:*
   a. ERE 412 is an elective course in which students can achieve required engineering design elective credits for the Environmental Resources Engineering program of study. ERE 412 emphasizes the engineering design process and requires a final design project. ERE 612 emphasizes physical and computational analysis and requires a final research paper.

2. *Relation to curriculum or to other ESF or Syracuse University courses:*
   a. Shared resource requirements: ERE 612
   b. Credit will not be given for both ERE 412 and ERE 612

STUDENT LEARNING OUTCOMES:

After completing this course the student should be able to:

1. Interpret from remotely sensed data, maps, reports, and site visits watershed climate, surficial geology, soils, basin area, topography and slopes, land cover, and stream order;
2. Define the eight governing variables determining river channel morphology and explain how river form relates to river function;
3. Survey in field: river pattern features of sinuosity, belt width, and radius of curvature; river profile features of thalweg and bankfull slopes; river cross-section features of area, width and depth; and river substrate material size distributions and roughness elements;
4. Compute bankfull discharge using three separate techniques such as field observation, regional regression, regional bankfull curves, flow frequency analysis; channel hydraulic geometry relations; and rainfall-runoff frequency analysis;
5. Extract from surveyed data key channel values to classify rivers using the Montgomery/Buffington and Rosgen methods;
6. Process surveyed data to generate standard dimensionless ratios used in engineering design for river restoration and management;
7. Apply computational sediment transport models with channel evolution theory to analyze channel stability and estimate channel response to restoration designs;

MAJOR CONCEPTS OR METHODOLOGIES:

River Form & Process exposes the student to fluvial geomorphology through measurement and interpretation of river pattern, profile, and dimension. Investigations of form and process will be initiated with maps and photographs to extract information on valley type and watershed characteristics, and then completed with detailed field exercises. Field exercises will provide site maps, photographs, descriptions, and survey points of river form and material relative to bankfull flow. River form will be surveyed to reveal the pattern of meanders and belt width, the profile of bed, water, and bankfull slopes, and the dimension of cross sections at steps, riffles and pools. Sediment surveys at cross sections and throughout longitudinal profiles will be used to characterize substrate distributions and roughness and together with site maps interpret dynamic forces and river processes. Rosgen as well as Montgomery and Buffington river classification techniques will be applied. Several computational and analysis approaches are used to estimate and critically evaluate bankfull or channel forming flow regimes. Students will utilize hydraulic and sediment transport models to examine the stability of river geometry and restoration designs across a range of flood frequencies, and analyze results relative to common channel evolution
theory. Design exercises will consider satisfying ecological and economic constraints, and uncertainty of modeling open, complex, and dynamic systems.

CATALOG DESCRIPTION (Please provide using the precise format to be included in the ESF catalog, please do not exceed 50 words)

ERE 412. River Form and Process (3)


Prerequisite(s): ERE340, ERE371, APM395. Note: Credit will not be given for both ERE 412 and ERE 612

COURSE HISTORY:

This course was approved by ESF COI in March 2008 and this 2010 update is requested to clarify the need for engineering probability and statistics as a prerequisite and to change the name from River Classification to River Form and Process. This name change reflects the expanded class scope on river processes and sediment transport beyond work in river classification.

Last approved: March 2008

Revised Draft: February 2, 2010 (form in protected format: 1/11/12)

This course was approved by Faculty Action Approved: April 14, 2008; Version: 5.5.2008

Revised course prefix from FEG 412 to ERE 412, and updated program and/or department name from Environmental Resources and Forest Engineering to Environmental Resources Engineering: January 11, 2012