Date: June 29, 2010
Course Number: ERE 612
Course Title: River Form and Process

☐ New Course  OR  ☒ Changes in existing course (check all that apply):

☐ Prefix
☐ Number
☐ Credits
☒ Title

☐ Description
☒ Pre-requisite(s)
☐ Co-requisite(s)

☐ Shared Resources
☐ Course Format
☐ Content
☐ Semester Offered

This course meets the General Education standards in the following knowledge and skills area (check all that apply):

☐ American History
☐ The Arts
☐ Basic Communication
☐ Humanities
☐ Mathematics
☐ Natural Sciences
☐ Other World Civilizations
☐ Social Sciences
☐ Western Civilization

Prequisites or co-requisite requirements:

☒ Prerequisites: Engineering Hydrology and Hydraulics, Engineering Probability and Statistics
☐ Co-requisites:

Institutional Impact:

Anticipated Enrollment: 10 per semester

Technology and Classroom Resource Demands: Projector for Internet and document camera

Computing Resources: Computers with MathCAD, ArcGIS, and public domain water engineering software

Library Resources: Online journals and database searches

Transportation Requirements: Vehicle for accessing field sites

Forest Properties or Field Practicum Facilities Required: Use of public access waterbodies
Health and Safety Considerations:

Conditions or situations present in association with the course?  Yes / No

1. Will substances with any of the following properties be used during instruction: flammability, toxicity, corrosivity, reactivity, registered pesticide, legally controlled, or other characteristics with the potential to cause harm or injury?  
   No

2. Will any physical hazards be present during instruction? (e.g., machines that need safety guards; razor blades or syringes; compressed gases, etc.).  
   No

3. Will any biological hazards be present during instruction? (e.g., handling animals (rabies or hantavirus); cultures or stocks of infectious agents (fungal spores, viruses, bacteria, etc.).  
   No

4. Will any radiation hazards be present during instruction? (e.g., radioisotopes, X-rays, ultraviolet rays, lasers, etc.).  
   Yes

5. Will any electrical equipment that, due to its design, location, or method of use, pose any threat to safety during instruction? (Give considerable thought to electrical use outdoors, or any potentially wet location.).  
   No

6. Will there be any personal safety issues related to the class? (e.g., due to time of day or location, at the end of any organized class exercise, will students be in danger of physical assault, etc.).  
   Yes

7. Will any students be driving official state or research sponsored land or water vehicles during any class or instructional exercise?  
   No

8. Will any type of personal protective equipment be necessary during class exercises? (e.g., hard-hats, eye/face protection, hearing protection, hand/foot protection, lab coat, visibility clothing, etc.)  
   Yes

If the answer was “Yes” to any of the HEALTH AND SAFETY questions, please explain:

4. This course uses standard surveying laser levels (currently Leica Rugby 100) to measure river morphology. Students are instructed to not stare into the laser beam. Protective glasses are not required for use of this laser instrument.

6. This course has off-campus components with travel to a local river and students will be exposed to river water and possibly waterborne diseases and flood waves. Travel from the ESF campus may take students in harms’ way, especially if they fail to yield to traffic, or if they don’t comply with water safety rules.

8. This course has outdoor components that include wading along riparian areas and in channels, and students are asked to wear appropriate clothing to keep covered and protected from intense sunlight or poisonous plants, cool in the intense heat, and clothing that will dry rapidly after rain showers. They are also asked to use appropriate foot protection, such as waders, for walking in rivers to keep dry and traction.

CATALOG DESCRIPTION (Please provide using the precise format currently used in the ESF catalog, please do not exceed 500 characters):

COURSE: ERE 612–River Form and Process
3 Credit Hours – Fall Semester
3 Hours Lecture Per Week
Prerequisite(s): Engineering Hydrology and Hydraulics, Engineering Probability and Statistics

SCOPE:

1. Level of Instruction:
   a. ERE 612 is an elective course in which students achieve field research and analytical methods important in the Water Resources Engineering area of study. It is a shared resource course with FEG 412. The FEG 412 course 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: FEG 412.
   b. Credit will not be given for both FEG 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; and
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. ERE612 students will perform the additional work of writing a 15 page research paper.

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

ERE 612. River Form and Process (3)


Prerequisites: Engineering Hydrology and Hydraulics, Engineering Probability and Statistics

COURSE HISTORY:

This course was approved by ESF COI in Mach 2008 and this 2010 update is requested to clarify the need for engineering probability and statistics as a prerequisite and to return 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: 6/29/10)