ESF Course Proposal Form
Committee on Instruction - ESF Faculty Governance
Office of Instruction & Graduate Studies

Date: June 7, 2010
Course Number: ERE445
Course Title: Hydrologic Modeling

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

☐ Prefix
☐ Description
☐ Shared Resources
☐ Number
☐ Pre-requisite(s)
☐ Course Format
☐ Credits
☐ Co-requisite(s)
☐ Content
☐ Title

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

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

Prerequisites or co-requisite requirements:

☒ Prerequisites: Introductory computer programming, Probability and Statistics, 1 year of Calculus.

☒ Co-requisites:

Institutional Impact:

Anticipated Enrollment: 10 per semester

Technology and Classroom Resource Demands:
Classroom with digital document projector and computer or hookup for laptop
Computers and Software (Fortran, Matlab, Minitab)

Library Resources:

Transportation Requirements:

Forest Properties or Field Practicum Facilities
Required:
Health and Safety Considerations:

Conditions or situations present in association with the course?  

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.).  
   - No

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.).  
   - No

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.)  
   - No

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

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

An exploration of deterministic and stochastic hydrologic models, model development, and the use of computer programming to construct, calibrate, manipulate, and interpret hydrologic models. Theoretical and analytical approaches to describing hydrologic processes, including precipitation, evapotranspiration, infiltration, surface runoff, percolation, and groundwater discharge. Stochastic techniques include frequency, trend, and regression analyses.
DETAILED COURSE DESCRIPTION

COURSE: ERE445 – Hydrologic Modeling
3 Credit Hours – Fall Semester
3 Hours Lecture Per Week
Prerequisite(s): Introductory Computer Programming, Probability and Statistics, 1 year of Calculus

SCOPE:

1. Level of Instruction:
   a. ERE445 explores stochastic and deterministic approaches to hydrologic modeling, and is intended for senior level engineering students.
   b. This course contains a series of small design projects throughout the semester.

2. Relation to curriculum or to other ESF or Syracuse University courses:
   a. ERE445 is an Engineering Design Elective in the Forest Engineering undergraduate curriculum in the Department of Environmental Resources and Forest Engineering.
   b. ERE445 is appropriate for students in other engineering programs and students with advanced quantitative skills in other environmental science related programs assuming they have had exposure to computer programming.
   c. Shared resource requirements: Meets with ERE645. Credit will not be granted for both ERE 645 and ERE 445.

STUDENT LEARNING OUTCOMES:

After completing this course the student should be able to:

1. Develop and program stochastic and deterministic hydrologic models

2. Understand analytical and theoretical approaches to modeling hydrologic processes, including precipitation, infiltration, evapotranspiration, groundwater discharge, runoff mechanisms, and streamflow

3. Understand uncertainty in environmental measurements, and how error in model inputs, parameters, and formulation impact model outputs

4. Critically evaluate hydrologic publications, models, and modeling results

5. Synthesize the major concepts in hydrology, and apply these concepts in engineering design applications

MAJOR CONCEPTS OR METHODOLOGIES:

This course will introduce students to a variety of deterministic and stochastic models of hydrologic phenomenon. The course focuses on model development, and emphasizes the use of computer programming to aid in the construction, manipulation, and interpretation of hydrologic models. Theoretical and analytical approaches to describing a wide variety of hydrologic processes are discussed, as well as various approaches to rainfall-runoff modeling. The course focuses on theoretical and analytical models of hydrologic processes, including precipitation, evapotranspiration, infiltration and soil moisture, surface runoff, percolation, groundwater discharge, and streamflow; stochastic models and modeling approaches applied to hydrology, including frequency analyses, regression approaches, and techniques for handling censored and missing data; hydrologic model construction and development, including techniques for model calibration and validation; and computer programming as a tool to assist in the efficient manipulation of large data sets, and the production of reproducible research results.
CATALOG DESCRIPTION  (Please provide using the precise format to be included in the ESF catalog, please do not exceed 50 words)

ER445. Hydrologic Modeling (3)

An exploration of deterministic and stochastic hydrologic models, model development, and the use of computer programming to construct, calibrate, manipulate, and interpret hydrologic models. Theoretical and analytical approaches to describing hydrologic processes, including precipitation, evapotranspiration, infiltration, surface runoff, percolation, and groundwater discharge. Stochastic techniques include frequency, trend, and regression analyses. Fall.

Prerequisite(s): Introductory computer programming, Probability and Statistics, 1 year of Calculus.

COURSE HISTORY:

This course has been taught regularly through 2007.


Revised Draft: February 8, 2010 Updated format and description.