USACE • TULANE RIVER SCIENCE AND ENGINEERING

Tulane University and the U.S. Army Corps of Engineers have partnered to create a unique, graduate level certificate program that focuses on teaching students both the science and engineering associated with river management. There is an emphasis on the academic underpinnings as well as pragmatic applications, and the interdisciplinary nature of rivers is stressed by including faculty who work in geology, civil engineering, geomorphology, river mechanics, biogeochemistry, ecology and numerical modeling. This program uses a hybrid distance learning format, combining self-taught modules with weekly face-to-face webinars and is available to students everywhere. This certificate program can, but does not have to, serve as a step toward a graduate degree in the subject.

The River Science and Engineering Certificate program will consist of the completion of one required course, RCSE 6800 – Introduction to River Science and Engineering, that will be offered every semester, and 4 of the 5 additional courses, totaling 15 hours. Students should plan to complete the Intro course before enrolling in additional courses, unless special permission is granted. Each of the six courses in the program will be three credit hours and be taught on the standard Tulane Fall and Spring semester schedule. The certificate program has received accreditation from SACS.

MORE INFORMATION

The department website provides prospective students with details about the program and more information and can be found at: **https://sse.tulane.edu/river**

Application and registration for all students will be held online. Following notification of acceptance into the program and granting of non-degree Tulane graduate student status, students will be provided course registration information.

The application can be found at:

https://applygrad.tulane.edu/apply/

REQUIREMENTS

An undergraduate degree in a field of science or engineering or permission of the River-Coastal Science and Engineering Department Chairman, Dr. Mead Allison is required. You may email Dr. Allison at meadallison@tulane.edu.

This program has been developed through an agreement with the USACE Engineering Research and Development Center's Graduate Institute. Corps of Engineers employees may seek more information from the Institute Director, Dr. Stanley Woodson at (601) 634-3549 or Stanley.C.Woodson@usace.army.mil or they may obtain more details on course content from the Program Coordinator, Dr. Barb Kleiss at bkleiss@tulane.edu.

Corps of Engineers employees should seek permission from their supervisors and have an APPROVED SF182 attached to an OBLIGATED training PRAC before enrolling in these classes. Employees of other government agencies should follow their agencies' guidelines for processing training requests.

For questions on application and registration processes not found on the website, contact Janet Morgan at morgan@tulane.edu or (504) 314-2910 and Florence Alexander can provide guidance on payment procedures for government agencies at falexand@tulane.edu.

CURRENT COURSE OFFERINGS

RCSE 6800 – Introduction to River Science and Engineering (Both semesters)

RCSE 6810 – River and Stream Restoration (Fall)

RSCE 6820 – River-Coastal Hydrologic and Hydraulic Modeling (Fall)

RCSE 6830 – River Mechanics and Management (Spring)

RCSE 6840 – Methods in River Sampling (Spring)

RCSE 6900 – Independent Study

COURSE DESCRIPTIONS

RCSE 6800 – Introduction to River Science and Engineering *Instructors: Kleiss, Allison, Biedenharn, Killgore, and Meselh*e
Rivers drain the majority of non-ice covered land surfaces on Earth and are the primary conduit for freshwater, minerals, carbon, and dissolved ions to the global ocean. In the 21st century, rivers large and small are being increasingly managed for flood control, as a source and water (agricultural, industrial, potable) recreation and navigation, all of which have environmental consequences. Future basin and global-scale climate changes must also be considered in management decisions. This course is designed to be a graduate and advanced undergraduate interdisciplinary examination of river science and engineering practices that can serve as a spring board to more advanced coursework on the disciplinary aspects covered. It will cover a wide range of topics such as sediment continuity, nitrogen dynamics, aquatic habitat assessment, and numerical modeling and will benefit resource managers who require an interdisciplinary overview of river systems to more effectively perform their professional duties in installation management, planning, hydrology and hydraulics, or regulatory fields. *(Fall and Spring semesters)*

RCSE 6810 – River and Stream Restoration *Instructors: Kleiss, Biedenharn, Killgore, and Murphy*
Rivers and streams are complex ecosystems which have interconnected geological, chemical and biological underpinnings. As the demands of human populations have increased over the past several centuries, rivers and streams have often been pushed beyond their ability to maintain the dynamic equilibrium inherent to the system. In recent decades, in an attempt to restore some of the values and functions to these systems, river and stream restoration has emerged as a multi-billion-dollar industry. This course will cover the definitions of river and stream restoration, discuss the planning process associated with solid restoration efforts, present restoration techniques, discuss environmental flows as restoration measures, present commonly applied design concepts and consider how uncertainty, monitoring and adaptive management may be applied to restoration efforts. The course will conclude with an opportunity for students to apply restoration concepts by developing an in-depth class presentation critiquing an existing river or stream restoration effort. *(Fall)*

RCSE 6820 – River-Coastal Hydrologic and Hydraulic Modeling *Instructor: Meselhe*
Numerical models are effective and informative research, design and planning tools. The substantial advancement in computational power has allowed numerical models to be a viable and efficient tool to solve complex problems and improve our understanding of the fundamentals in the water resources field. This introductory modeling course provides a general overview of the basics of numerical modeling, model development and applications, numerical modeling techniques and the ability to recognize the strengths and limitations of these techniques. It will include hands-on training on model applications to watersheds, streams, and large rivers. The course will conclude with an opportunity for students to develop their own code (or build upon existing and publicly available codes) and apply these tools to a natural system to examine a research, design or planning problem and explore ways that the model can provide usable information to answer research/science questions. *(Fall)*

RCSE 6830 – River Mechanics and Management *Instructor: Biedenharn*
This course introduces students to a wide range of topics related to the engineering and management of river systems. This includes an advanced examination of fluvial processes, channel stability concepts, sediment transport, geomorphic assessment tools, and stable channel design. Design considerations for commonly used engineering features such as bank stabilization, grade control structures, diversion structures, and other commonly used restoration features will be explored. While this class will necessarily involve some of the mathematics and theoretical underpinnings of river mechanics, this will not be a primary emphasis of the class. Rather, this class will focus on the practical application of river mechanics concepts, based both both government and corporate practice, and is tailored to a wide range of students, including engineers, planners, biologists, geologists and others interested in developing a broader understanding of river management. *(Spring)*

RCSE 6840 – Methods in River *Sampling* *Instructors: Allison, Killgore, Kleiss and Murphy*
Tools and procedures developed for sampling and monitoring riverine systems over the last century are distinct from those developed for other aqueous environments. In addition to the need for tools tailored for systems of a wide range of size, energy, and setting, effective river monitoring also needs to capture highly episodic hydrographs that encompass large overbank areas during floods. River monitoring has profound implications implications in managing rivers for human use and for channel and riparian ecosystem health. Rivers are also highly sensitive to climate, and historical records of their behavior are a key indicator or changing climate on a basin and global scale. This course is designed to examine river sampling as conducted by agencies and academic researchers, including the use of remote sensing, and the collection of ecological, water chemistry, hydrological, sediment and morphological data sets. Historical data will be examined to define best practices of data analysis and statistical analytical procedures, and to examine the impact of evolving technology on the interpretation of river and stream records. As effective monitoring programs are an essential element of adaptive management, this course also will assist in the development of quality adaptive management plans. *(Spring)*

RCSE 6900 – Independent Study *Instructors: Allison, Biedenharn, Killgore, Kleiss, Meselhe and Murphy*
Independent study which will support a student's academic or professional needs may be organized with the appropriate faculty.