

## HOW TO APPLY

The official application should be made directly to the Graduate School either online or by mail before April 1 for admission for Summer or Fall or October 1 for admission for Spring. A non-refundable \$25.00 application fee is required from non-residents of Mississippi. To apply for graduate studies at NCCHE, it is important that the candidate checks only the "Computational Hydroscience" under Master of Science or Doctor of Philosophy in Engineering Science on the application form, depending on the studies he/she is applying for. To download the application form, go to the web page [http://www.olemiss.edu/depts/graduate\\_school/forms/grad\\_school\\_app.pdf](http://www.olemiss.edu/depts/graduate_school/forms/grad_school_app.pdf).

## LOCATION AND FACILITIES

National Center for Computational Hydroscience and Engineering has its offices on the main campus of the University of Mississippi located in Oxford, MS. Live Cams at <http://www.olemiss.edu/livecam/> gives a real time glimpse of the beautiful Ole Miss Campus with everything one would need in a modern university setting. You may also take a virtual tour of the campus at: <http://www.olemiss.edu/tour/>. Despite its rapid growth in the recent years, the city of Oxford still preserves all the charms of a small southern university town. The city of Memphis is only about an hour drive away with all the possibilities offered by a large metropolitan center. NCCHE enjoys all the privileges offered by the Campus: a modern library, super computing facilities, fast Internet connection, sports and recreation centers, etc. The NCCHE has also its own computer center and Intranet. The faculty and staff work using the latest technology software, personal computers, servers, and cluster computing system.

## IMPORTANT LINKS

NCCHE: <http://www.ncche.olemiss.edu/>

The University of Mississippi main page: <http://www.olemiss.edu/>

Graduate School: [http://www.olemiss.edu/depts/graduate\\_school/](http://www.olemiss.edu/depts/graduate_school/)

Prospective students: [http://www.olemiss.edu/depts/graduate\\_school/prospects.php](http://www.olemiss.edu/depts/graduate_school/prospects.php)

International students / Office of International Programs: <http://www.studyatusa.org/>

City of Oxford: <http://www.oxfordms.net/>

Oxford Tourism Council: <http://www.oxfordcvb.com/>

Oxford Chamber of Commerce: <http://www.oxfordms.com/>

## CONTACT INFORMATION

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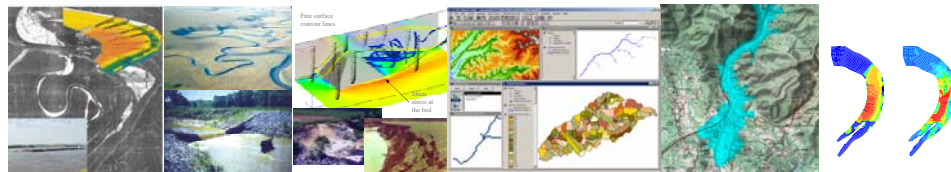
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National Center for Computational Hydroscience and Engineering

School of Engineering, University of Mississippi

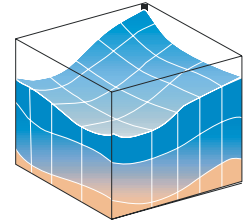
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# NATIONAL CENTER FOR COMPUTATIONAL HYDROSCIENCE AND ENGINEERING

*The University of Mississippi*



## GRADUATE STUDY PROGRAMS IN COMPUTATIONAL HYDROSCIENCE AND ENGINEERING

The National Center for Computational Hydroscience and Engineering (NCCHE) is offering a unique opportunity to promising researchers and engineers to carry out graduate studies leading to the M.S. and Ph.D. degrees in the area of Computational Hydroscience and Engineering in a highly stimulating scientific environment. Supervised by internationally recognized faculty and research staff, the program places a strong emphasis on original research.

## WHAT IS NCCHE?

Established in 1989, NCCHE is mandated by the U.S. Congress to carry out research for the advancement of the state of the art in numerical-empirical modeling for enhancing the understanding of free-surface flows, soil erosion, sediment transport phenomena, and applications to soil erosion controls (in support of the DEC Project). Today NCCHE enjoys a well earned reputation as a serious research center in mathematical and numerical modeling in both national and international circles, and offers a complete line of one-, two- and three-dimensional numerical models to study real-life problems in the areas of hydrology, hydraulics, hydrodynamics, soil erosion, sediment transport, water resources and quality, ecologic and environmental engineering, etc. These state-of-the-art models with proven capabilities have all been subjected to a systematic verification and validation procedure.

Application areas of the models include reservoir sedimentation, channel incision, stream bank erosion, gully erosion, head-cut migration, upland soil erosion, local scour around spur dikes and bridge piers, vegetation effects on erosion and sediment transport, flood control, chemical spill, pollutant transport, water quality, aquatic ecology, coastal morphodynamics, interaction between surface and subsurface flows, etc. Many academic, governmental and industrial institutions are users and/or beta-testers of NCCHE models.

NCCHE maintains strong collaborative research ties within the International scientific community. Members of NCCHE play an active role in various professional societies and organizations. NCCHE has organized many international conferences and published many books, journal articles, and conference papers.

NCCHE has the status of a Department within the School of Engineering of the University of Mississippi, and enjoys all the privileges offered by the University Campus.

## WHY STUDY CHE?

Despite its relatively short history spanning only the last 60 years, the computer simulation science and technology are making a dramatic impact on all branches of science and engineering. The advances in the areas of mathematical modeling, numerical methods, computer hardware and software, computer visualization, and geospatial technologies have helped numerical models simulating natural phenomena to become an indispensable tool for design and operation of complex engineered systems. Recently a Blue Ribbon Panel convened by the U.S. National Science Foundation (NSF) explored the impact of "simulation-based engineering science (SBES)" on science and technology and identified the future challenges. The panel strongly emphasized the need for education of the next generation of engineers and scientists in the theory and practices of SBES.

## WHAT ARE THE CAREER OPPORTUNITIES?

Career opportunities for those who have completed graduate studies in Computational Hydroscience and Engineering, which is a particular branch of SBES, include academia, engineering companies and research centers, and state and federal agencies, where numerical simulation based design, optimization and decision making play an ever increasingly critical role.

## AREAS OF FOCUS AND RESEARCH

- 1D, 2D, and 3D modeling of unsteady, turbulent free surface flows
- 1D, 2D, and 3D modeling of fluvial morphodynamics, meandering, local scour, bank erosion, and vegetation effects
- Erosion, transport, and deposition of sediments (cohesive and non-cohesive)
- 1D, 2D, and 3D modeling of pollutant transport with adsorption and desorption, water quality, and aquatic ecological processes
- Integrated watershed and channel modeling for flow, sediment transport, pollutant transport, and water quality
- Decision support systems for integrated watershed modeling
- 1D and 2D flood simulations with shock-capturing conservative schemes, and related GIS-based decision support systems
- 1D, 2D, and 3D modeling of coastal/estuarine processes
- System engineering, numerical optimization and flood control

## CRITERIA FOR ADMISSION

NCCHE graduate program is a part of the University of Mississippi graduate programs. The applicants must meet the requirements described in the Graduate School Catalog, which can be downloaded at :

[http://www.olemiss.edu/depts/graduate\\_school/Catalogs/2005GradCatalog.pdf](http://www.olemiss.edu/depts/graduate_school/Catalogs/2005GradCatalog.pdf).

In addition, the applicant should satisfy the following criteria:

1. Commitment to the study of Computational Hydroscience and Engineering.
2. The applicant should have taken at least some of the following courses or their equivalents: Hydraulics, Sediment Transport, Fluid Mechanics, Hydrology, Numerical Methods, Partial Differential Equations, GIS Technology, etc.
3. The applicant should be able to program with at least one of the common computer languages, such as FORTRAN, C, and C++.

Working experience in Computational Hydraulics, Sediment Transport Modeling, Pollutant Transport/Water Quality Modeling, and related areas will be an advantage.

## TOEFL AND GRE TEST REQUIREMENTS

The candidates applying for graduate studies must submit their TOEFL (required of individuals whose native language is not English) and GRE scores and college transcripts together with their application. The minimum TOEFL score is 550 in paper-based test or equivalents in other test forms. The candidates are also encouraged to submit two reference letters and a personal statement. For additional information please consult the following web page:

[http://www.olemiss.edu/depts/graduate\\_school/finaid.php](http://www.olemiss.edu/depts/graduate_school/finaid.php)

## SCHOLARSHIP AND TUITION FEES

The candidates admitted to the NCCHE graduate program may be offered a Graduate Assistantship with a scholarship. The Graduate Assistants are expected to work up to 20 hours per week on the projects that will be assigned to them. During summer break, the number of hours of work may be increased up to 40 hours per week depending on the availability of the funds and the needs of the projects. In addition, M.S. and Ph.D. students who obtain TOEFL and GRE scores above a pre-determined level and who comply with certain criteria regarding their grade point average (GPA) may be eligible for an "Honors Scholarship" given by the University of Mississippi on a per year basis. The tuition fees and the non-resident fees are generally waived for graduate students receiving a scholarship above a certain limit.

## TYPICAL COURSES

The following courses are offered by NCCHE faculty:

[Introduction to Free-Surface Hydraulics and Sediment Transport](#): Basic concepts of free-surface flow in open channels with fixed bed, hydrodynamic equations, notions of specific-energy and specific force, velocity profiles for different flow regimes, uniform flow on fixed and mobile beds, channel bends, surface instabilities, gradually varied flow, flow on a mobile bed and sediment transport (bed load, suspended load, total load).

[Computational Methods and Applications in Free Surface Flows](#): Numerical methods in the field of hydraulics and fluid mechanics, including finite difference, finite volume, and finite element methods.

[Sediment Transport Modeling](#): Fundamental theory and numerical methods in the simulation of flow, sediment transport, and morphological changes in rivers. Topics include sediment transport theory, governing equations, boundary conditions, numerical solution techniques, and application examples.

[Flow and Transport Processes in Rivers and Reservoirs](#): Review of free-surface flows with fixed and mobile beds (conservation laws, equations of motion, uniform flow, and gradually varied flow), unsteady flow in open channels, 1D sediment transport in rivers and reservoirs, morphodynamics of rivers, gravity currents in reservoirs and lakes, and diffusion/dispersion of matter in rivers and its environmental aspects.

[Pollutant Transport and Water Quality Modeling](#): Generalized theory and modeling techniques for pollutant transport and water quality in surface-water systems: rivers, lakes, and estuaries.

In addition, the students may take courses offered by Departments of Civil Engineering, Mechanical Engineering, Geology and Geological Engineering, Computer Science, and Biology, if permitted by their supervisors. The courses include Fluid Mechanics, Flow in Open Channels, Sediment Transport, Numerical Heat Transfer and Fluid Flow, Groundwater Model, Contaminant Transport, and Finite Element Analysis.