

NCCHE Graduate Program

National Center for Computational Hydroscience and Engineering (NCCHE)
The University of Mississippi

Director: Dr. Sam S. Y. Wang, 102 Carrier Hall

Graduate Program Coordinator: Dr. Weiming Wu, Research Associate Professor

Faculty: Dr. Sam S. Y. Wang, F.A.P. Barnard Distinguished Professor; Dr. Mustafa Altinakar, Research Professor; Dr. Yafei Jia, Research Professor; Dr. Weiming Wu, Research Associate Professor; Dr. Yan Ding, Research Assistant Professor; and Dr. Xinya Ying, Research Assistant Professor.

1. Graduate Degrees Offered

NCCHE offers the degrees of Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) in Engineering Science with emphasis in Computational Hydroscience and Engineering.

The M.S. in Engineering Science with emphasis on Computational Hydroscience and Engineering is intended to prepare the student with advanced technical knowledge and communication skills for pursuing a career in industry, engineering research and development, or public/government service. The M.S. degree can be achieved by completing a thesis (thesis option) or a research project report (non-thesis option). The former is required to have a final oral defense of the thesis research, and the latter is required to pass an oral comprehensive qualification examination.

The Ph.D. in Engineering Science with emphasis on Computational Hydroscience and Engineering is intended to prepare the student with advanced technical knowledge, original and independent research capabilities and communication skills for pursuing a career in industry, engineering research and development, public/government service, or for academic career. The students with a variety of academic backgrounds such as civil engineering, mechanical engineering, environmental science/engineering, physics, etc. are suitable for admission to this program. Passing a comprehensive qualification exam is required for all Ph.D. candidates.

The M.S. and Ph.D. candidates must meet the general requirements described in the Graduate School Catalog and the specific requirements of NCCHE given in the following sections.

2. Application for Graduate Study

The official application should be submitted online with a hard copy of supporting documents being sent directly to the Graduate School by mail before April 1 for

admission for Summer or Fall Semester or before October 1 for admission for Spring Semester. A non-refundable application fee of \$25.00 is required for non-residents of Mississippi. To apply for graduate studies at NCCHE, the applicant should check only the box of “Computational Hydrosience” under Master of Science or Doctor of Philosophy Degree in the Engineering Science programs on the online application form.

3. Admission Criteria

Because NCCHE graduate program is one of the graduate programs offered by the School of Engineering of the University of Mississippi, the applicants must meet all requirements that are described in the Graduate School Catalog. In addition, the applicants should:

- be strongly interested in the study of Computational Hydrosience and Engineering;
- have taken several basic courses in Hydraulics, Sediment Transport, Fluid Mechanics, Hydrology, Numerical Methods, Partial Differential Equations, GIS Technology, etc.;
- be competent to program with at least one of the common computer languages, such as FORTRAN, C, and C++;
- have some experience in Computational Hydraulics, Sediment Transport Modeling, Pollutant Transport/Water Quality Modeling, or related areas.

4. Advisor and Advisory Committee

In the first semester, each new student is assigned a temporary advisor by the Director of NCCHE. During the first year, the student is expected to meet with at least three graduate faculty members of NCCHE to learn about their research areas and projects. This will help the student to make up an informed decision for choosing his/her interested area and a NCCHE faculty working in that area to be his/her permanent advisor. This decision should normally be made no later than the end of the first semester for the M.S. students and no later than the second semester for the Ph.D. students. Before the permanent advisor is decided, the course selection and load of the student and the participation in the research projects of NCCHE will be decided by the temporary adviser.

In consultation with the permanent adviser, a faculty advisory or thesis/dissertation committee consisting of at least three additional graduate faculty members (one from other discipline) is to be approved by the Director of NCCHE, which will direct the student’s research program. The chair of the committee or permanent supervisor must be a full member of the graduate faculty; otherwise, approval by the Graduate Council is required.

5. Ph.D. Comprehensive Exam

Each Ph.D. student must pass the comprehensive exam as part of the qualification to become a Ph.D. candidate. The comprehensive exam in NCCHE covers four subjects:

1. Applied Mathematics;

2. Numerical Methods (Finite Element Method, Finite Difference Method, Finite Volume Method);
3. Fluid Mechanics;
4. Open-Channel Flow and Sediment Transport.

This exam includes written and oral parts. In the written exam, each subject area will have three to five problems. The written exam takes eight hours in a working day. Only those who have passed the written exam are allowed to take the oral exam. Usually the student can ask to take the comprehensive exam in either the third or fourth semester when all required course works have almost been finished.

6. Topic of Thesis and Dissertation

The student can pick up any topic related to Computational Hydroscience and Engineering as his/her thesis or dissertation topic. However, the student is encouraged to choose the topic related to one of NCCHE's funding projects. If the topic is part of an on-going research project, the student can carry out the thesis or dissertation research using NCCHE's research assistantship. If the student chooses a topic not related to any NCCHE research project, he/she needs receive an agreement from a faculty advisor and self-support the study.

7. Degree Requirements

7.1 Degree Requirements for the M.S. Program

The Master of Science program has two options: thesis-based and project-based:

Thesis-based Option: This option entails at least 24 credit hours of course work, which comprises 12 credit hours of core courses in Numerical Methods, Fluid Dynamics, Transport Phenomena, and Hydrosciences, and 12 credit hours of approved electives. In addition, the student is required to take at least 6 credit hours of Thesis. Table 1 summarizes the minimum course requirements for this option.

The student is expected to:

- attend research seminars organized by NCCHE and give at least one presentation during a semester;
- pass the oral defense of his/her thesis successfully;
- publish at least one technical paper in either a journal or the proceedings of a conference.

Project-based Option: This option entails at least 27 credit hours of course work, which comprises 12 credit hours of core courses in Numerical Methods, Fluid Dynamics, Transport Phenomena, and Hydrosciences, and 15 credit hours of approved electives. In addition, the student is required to take at least 3 credit hours of Research Project. Table 2 summarizes the minimum course requirements for this option.

The student is expected to:

- attend research seminars organized by NCCHE and give at least one presentation during a semester;
- pass the comprehensive oral exam successfully;
- publish at least one technical paper in either a journal or the proceedings of a conference.

Table 1 Master of Science Program — Thesis based

1.	Required Courses			Credit Hours
ENGR	603	Fluid Mechanics I	3	
CE	541	Flow in Open Channels	3	
CE	543	Sediment Transport	3	
ENGR	691	Advanced Numerical Methods	3	
ENGR	695	Seminars		
Total Required Course Credit Hours			12	
2.	Thesis			Credit Hours
Total Thesis Credit Hours			6	
3.	Electives			Credit Hours
ENGR	590	Finite Element Analysis I		
ENGR	591, 592	Engineering Analysis		
ENGR	604	Fluid Dynamics II		
ENGR	606	Numerical Heat Transfer & Fluid Flow		
ENGR	691	Open Channel Flow Modeling		
ENGR	691	Sediment Transport Modeling		
ENGR	691	Pollutant Transport & Water Quality Modeling		
Total Elective Course Credit Hours			12	
Total Thesis-based M.S. Degree Credit Hours (12+12+6)			30	

Table 2 Master of Science Program — Project based

1.	Required Courses			Credit Hours
ENGR	603	Fluid Mechanics I		3
CE	541	Flow in Open Channels		3
CE	543	Sediment Transport		3
ENGR	691	Advanced Numerical Methods		3
ENGR	695	Seminars		
Total Required Hours				12
2.	Project (Research or Engineering Design)			Credit Hours
Total Thesis Hours				3
3.	Electives			Credit Hours
ENGR	590	Finite Element Analysis I		
ENGR	591, 592	Engineering Analysis		
ENGR	604	Fluid Dynamics II		
ENGR	606	Numerical Heat Transfer & Fluid Flow		
ENGR	691	Open Channel Flow Modeling		
ENGR	691	Sediment Transport Modeling		
ENGR	691	Pollutant Transport & Water Quality Modeling		
Total Elective Hours				15
Total Degree Hours				30

7.2 Degree Requirements for the Ph.D. Program

The Ph.D. program involves 54 credit hours of course work (including core courses and electives) beyond the Bachelor's degree and 30 credit hours of course work beyond the Master's degree, in addition to 12 credit hours of research topics and 18 dissertation credit hours. These minimum requirements are summarized in Table 3. Students may specialize in either hydrosience/engineering system modeling or computational methodologies applicable to hydro-systems modeling. Other requirements include:

- active participation in research seminars, and presenting one or more research seminars in each semester;
- successful completion of assigned research projects;
- passing comprehensive written and oral exams successfully;
- preparation and successful defense of the Prospectus for Dissertation Research;
- completion and successful defense of the Ph.D. dissertation work and manuscript;
- publication of at least two refereed papers (preferably one of them to be published in a professional journal) before graduation.

Table 3 Doctoral Program

1.	Required Courses			Credit Hours
ENGR	603	Fluid Mechanics I	3	
CE	541	Flow in Open Channels	3	
CE	543	Sediment Transport	3	
ENGR	604	Fluid Dynamics II	3	
ENGR	606	Numerical Heat Transfer & Fluid Flow	3	
ENGR	691	Advanced Numerical Methods	3	
ENGR	691	Open Channel Flow Modeling	3	
ENGR	691	Sediment Transport Modeling	3	
ENGR	691	Pollutant Transport & Water Quality Modeling	3	
ENGR	702	Finite Element Analysis of Fluid Flow	3	
ENGR	695	Seminars	3	
Total Required Hours			30	
2.	Research Topics			Credit Hours
Total Research Topic Hours			12	
3.	Dissertation			Credit Hours
Total Dissertation Hours			18	
4.	Electives			Credit Hours
ENGR	590	Finite Element Analysis		
ENGR	591, 592	Engineering Analysis		
ENGR	593, 594	Approximate Methods of Engineering Analysis I, II		
ENGR	605	Convective Heat and Mass Transfer		
ENGR	640	Stream & Estuary Analysis		
ENGR	690	Finite Element Analysis II		
ENGR	711	Turbulence		
Total Elective Hours			24	
Total Degree Hours (beyond B.S. degree)			84	