

# Computer Science

## The George R. Brown School of Engineering

### Chair

Moshe Y. Vardi

### Professors

Robert S. Cartwright, Jr.  
Keith Cooper  
Ronald N. Goldman  
G. Anthony Gorry  
Kenneth W. Kennedy, Jr.  
Joe D. Warren  
Willy E. Zwaenepoel

### Adjunct Professors

Jack Dongarra  
Leland Ellis  
Geoffrey Fox  
Bowen Loftin  
S. Lennart Johnsson

### Associate Professors

Alan L. Cox  
Peter Druschel  
Dave Johnson  
Lydia Kavradi  
Devika Subramanian

### Adjunct Associate Professors

P. Read Montague  
Scott K. Warren

### Assistant Professors

Scott Rixner  
Dan Wallach

### Adjunct Assistant Professor

Vikram Adve

### Research Scientists

Bradley Broom  
Zoran Budimlic  
Robert Fowler  
Richard Hanson  
Guohua Jin  
Linda Torczon

### Lecturers

Ian Barland  
Ed Chen  
John Greiner  
Dung “Zung” Nguyen

### Postdoctoral Research

### Associates

Armando Tacchella  
Ming Zhang

### Joint Appointments

#### (with Electrical and Computer Engineering)

#### Professor

J. Robert Jump

#### Associate Professors

Joseph Cavallaro  
Peter Varman

#### Assistant Professor

Edward Knightly

#### (with Psychology)

#### Professor

Daniel N. Osherson

#### (with Chemistry)

#### Professor

James Tour

*Degrees Offered: B.A., B.S., M.C.S., M.S., and Ph.D.*

Computer science is concerned with the study of computers and computing, focusing on algorithms, programs and programming, and computational systems. The main goal of the discipline is to build a systematic body of knowledge, theories, and models that explain the properties of computational systems and to show how this body of knowledge can be used to produce solutions to real-world computational problems. Computer science is the intellectual discipline underlying information technology, which is widely accepted now as the ascendant technology of the next century. Students in computer science at Rice benefit from the latest in equipment and ideas as well as the flexibility of the educational programs. The research interests of the faculty include algorithms and complexity, artificial intelligence and robotics, compilers, distributed and parallel computation, graphics and visualization, operating systems, and programming languages.

The department offers two undergraduate degrees: the Bachelor of Arts degree (B.A.) and the Bachelor of Science degree (B.S.). The department offers two master's degrees: the professional Master of Computer Science degree (M.C.S.) and the research-oriented Master of Science degree (M.S.). The department also offers a doctoral degree (Ph.D.).

A joint M.B.A./Master of Engineering degree is also available in conjunction with the Jesse H. Jones Graduate School of Management.

### **Degree Requirements for B.A. in Computer Science**

For general university requirements, see Graduation Requirements (pages 16–18). The undergraduate program in computer science has been designed to accommodate a wide range of student interests. The program is sufficiently flexible for a student to customize it to her or his interests. A student can develop a broad educational program that couples computer science education with a variety of other fields in engineering, natural sciences, the humanities, or social sciences. Alternatively, a program might be designed for a student preparing for graduate study in computer science or possibly for a career in computing and information technology.

The undergraduate program consists of required core courses, which are introductory courses covering material required of all majors; required breadth courses, which are upper-level courses ensuring knowledge in a broad range of areas; and electives that give students the freedom to explore specific interests. Students majoring in computer science must complete between 58 and 60 semester hours of courses in these three categories.

**Core Courses** (8 courses for a total of 28 hours, required for all majors, usually taken in the freshman and sophomore years)

MATH 101/102 *Single Variable  
Calculus I and II*  
COMP 210 *Introduction to Principles of  
Scientific Computation*  
COMP 212 *Intermediate Programming*  
COMP 280 *Mathematics of Computer  
Science*  
COMP 314 *Applied Algorithms and  
Data Structures*  
COMP 320 *Introduction to Computer  
Organization*

**1 course from the following:**  
MATH 211 *Ordinary Differential  
Equations and Linear Algebra*  
MATH 212 *Multivariable Calculus*  
MATH 221 *Honors Calculus III*

**Breadth Courses** (7 courses for a total of 23 hours, required for all majors, usually taken in the junior and senior years) (\* = preferred choice)

STAT 331\*  
or 310 *Probability*

CAAM 353 *Numerical Analysis*

MATH 355\*

or CAAM 335 *Linear Algebra*

COMP 311 or 412 *Programming  
Languages*

COMP 481 or 482 *Theory*

COMP 421 *Operating Systems*

ELEC 326 *Digital Circuits*

**Electives** (2 courses for a total of 6 to 8 hours in computer science at the 300 level or higher)

## Degree Requirements for B.S. in Computer Science

The B.S. degree is designed for students who are interested in a more in-depth study of computer science in order to prepare themselves for a professional career in the computing industry. To receive a B.S. degree, a student must complete all the requirements of the B.A. degree (i.e., core, breadth, and electives), with the addition of PHYS 101/102 (or PHYS 111/112) (7 hours) to ensure a strong scientific background. In addition, the student must complete the depth component. This component consists of a coherent set of four or five courses specializing in some area of computer science. The same course cannot satisfy both the breadth requirement and the depth requirement. Students can adopt a preset depth component or design their own components, consisting of at least 15 hours. B.S. degree plans have to be approved by departmental advisers by no later than the end of the junior year. Sample curricula are listed on the departmental website; more information is available from department advisers. The computer science requirements of the B.S. degree total 79 to 81 semester hours. For a B.S. degree in computer science, a total of 128 semester hours is required.

## Degree Requirements for M.C.S., M.S., and Ph.D. in Computer Science

**Master's Programs.** For general university requirements, see Graduate Degrees (pages 60–65). The professional M.C.S. degree is a terminal degree for students intending to pursue a technical career in the computer industry. To earn the M.C.S. degree, students must successfully complete 30 semester hours of course work approved by the department and following the plan formulated in consultation with the department adviser.

Areas of concentration for the M.C.S. include algorithms and complexity, artificial intelligence, compiler construction, distributed and parallel computing, graphics and geometric modeling, operating systems, and programming languages. The professional program normally requires three semesters of study.

The M.C.S. degree with a concentration in Bioinformatics is for students intending to pursue a technical career in the biotechnology industry. Students learn to integrate mathematical and computational methods to analyze biological, biochemical, and biophysical data. This program requires prior background in computer science, biosciences, and mathematics. To earn this degree, students must successfully complete 40 hours of approved course work meeting departmental requirements. This program normally requires four semesters of study.

The M.S. degree is a research degree requiring a thesis in addition to course work.

**Ph.D. Program.** The Ph.D. degree is for students planning to pursue a career in computer science research and education. The doctoral program normally requires four to six years of study. To earn a Ph.D. in computer science, students must:

- Meet departmental course requirements
- Complete a COMP 590 project by the end of the third semester
- Complete a master's thesis by the end of the fifth semester, if a previous master's thesis has not been approved by the graduate committee
- Pass a qualifying examination in an area of specialization within seven semesters after entering the Ph.D. program
- Conduct original research, submit an acceptable Ph.D. thesis proposal, and successfully defend the thesis proposal
- Submit an acceptable Ph.D. thesis that reports research results and pass a final oral defense

Students who successfully meet the first three requirements are awarded the Master of Science degree. Students successfully meeting all requirements, plus any departmental and university requirements, are awarded the Ph.D. degree.

**Financial Assistance.** Fellowships and research assistantships are available to students in the Ph.D. program. Both provide a monthly stipend for the academic year and cover all tuition expenses. More substantial monthly stipends may be available during the summer for students working on departmental research projects. In all cases, continued support is contingent on satisfactory progress in the program. Ph.D. students also are expected to assist in the teaching and administration of undergraduate and graduate courses.

**Additional Information.** For further information and application materials, write the Department of Computer Science—MS 132, Rice University, P.O. Box 1892, Houston, Texas 77251-1892.

**See COMP (pages 300–307) in the Courses of Instruction section.**