

DOCTOR OF PHILOSOPHY IN COMPUTER SCIENCE
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I. Introduction

Doctoral training in computer science at LSU offers talented students the opportunity to prepare for research careers in universities or industrial laboratories. There is a strong and continuing demand for computer scientists to work at the frontiers of knowledge in both theoretical and applied specialties. The curriculum provides for graduate study in several areas of computer science including algorithms, computer architecture, artificial intelligence, theoretical computer science, software engineering, information retrieval, database management, operating systems, high performance computing, robotics, scientific computation, and programming languages and compilers.

II. Degree Requirements

All Graduate School regulations and procedures apply. The basic process for satisfying the degree requirements for the doctorate is as follows:

1. The student, immediately upon entering the program, contacts the Graduate Advisor of the Department of Computer Science, who serves as the interim advisor. The student and his/her advisor together assess the student's curriculum requirements, and the student begins to schedule courses. A beginning student normally takes three years of graduate course work above the baccalaureate, generally resulting in a minimum of forty-eight graduate credit hours.
2. During the first year of enrollment, the student should initially consider a research specialization area and request a major professor who is involved in that area and is willing to supervise the student's research. The **major professor** is chosen from the Graduate Faculty of Computer Science. In the event that the research area requires additional supervision from a faculty member not in the Department of Computer Science, a "research advisor" must also be chosen from the Graduate Faculty in that area. The student should also choose a minor field.

The faculty member administering the written General Examination, in conjunction with the student's major professor and the Chairman of the Department of Computer Science, determines at that time whether or not the student is proficient in written English.

3. By the end of the first year of study, the student should file a plan of study which specifies research goals and curriculum plans. Once the plan of study has been accepted by the student's advisory committee, the Chairman of the Department of Computer Science, and the Graduate School, the student becomes an applicant for the doctorate. Moreover, the student can now begin to fulfill the residency requirement, which consists of two successive semesters of full-time coursework. With this plan of study, the student requests an advisory committee consisting of the major professor, at least one other faculty member from the Graduate Faculty of Computer Science, and a professor from the Graduate Faculty in the minor

field. Although each student is responsible for his/her own progress through the program, the advisory committee is responsible for ensuring that the student's curriculum is of high academic quality and appropriate to allow the student to pursue his/her research and career goals. The committee, chaired by the major professor, also advises the Chairman of the Department of Computer Science on matters concerning the student. The committee is nominated by the Chairman of the Department of Computer Science and approved by the Dean of the Graduate School. At least one member of the advisory committee must be a full member of the Graduate Faculty.

4. The student continues the course work, as indicated in the plan of study. The coursework includes courses in the minor field and the research tools requirement. The research tool requirement consists of two courses in statistics at the 7000+ level. The student must also complete the seminar requirement CSC 7800.

The central focus of the doctoral program is research. The student is encouraged to begin as soon as possible to participate in research, often guided by ongoing faculty research projects. Students should also develop dissertation research plans as early as is reasonable. To facilitate this effort, the student should consider taking reading courses and seminars in the appropriate areas.

5. The student, upon completion of the research tools requirement and any course work to help the student improve his/her English proficiency, requests permission to take the Written General Examination.
6. After the student has passed the Written General Examination, the student must submit a written proposal of his/her doctoral research project to the student's committee. The proposal will be discussed and defended before the student's advisory committee in the oral general examination. In order to keep the advisory committee informed of progress, the student must meet with the committee at least once every regular semester after the oral defense of the dissertation proposal.
7. When petitioning for the oral defense of the dissertation proposal, the advisory committee must include at least four members, two of whom are members of the Graduate Faculty of Computer Science. From the two members from Computer Science, at least one must be a full member. The complete committee must consist of at least two full members of the graduate faculty.
8. Once the student passes the oral examination, the student is admitted to candidacy for the degree. The student should now begin to take the CSC 9000 dissertation research course, if he/she has not already begin to do so. At least nine hours of CSC 9000 must be taken.
9. The student carries out the proposed dissertation research, writes the dissertation, and submits it to his/her advisory committee.

10. The student defends the dissertation in a public oral examination before his/her advisory committee. Formal approval of the dissertation by the committee and by the Graduate School constitutes completion of the requirements for the doctoral degree.

III. Minor Field

Every student is required to choose a minor field with the help of his/her advisory committee. The requirements for the minor, which are usually set by the department offering the minor in conjunction with the Department of Computer Science, generally include at least twelve hours of graduate course work, a general examination, and a representative faculty member from the minor department on the student's advisory committee. The minor professor will also choose how to conduct the minor portion of the General Examination, again in conjunction with the Department of Computer Science.

IV. English Language Proficiency Requirement

Anyone pursuing a career in a technical field must be able to write clear English prose. The faculty members administering the General Examination, in conjunction with the student's major professor and the Chairman of the Department of Computer Science, will determine at the time of that examination whether or not the student can write sufficiently well. If a student's writing skills are evaluated as substandard, then the student and his/her advisory committee must devise a plan of study to bring those skills up to standard. Any courses prescribed by this plan must be completed before the student is eligible to submit a dissertation proposal.

V. Research Tools Requirement

Each student must take two 7000+ level courses in statistics. These courses must be approved by the student's advisory committee.

VI. Seminar Requirement

Each student must take the research seminar course, CSC 7800. The course is designed to provide a forum for doctoral students to make formal presentations on research topics for evaluation and feedback of technical content and presentation style.

VII. General Examination

An entering student who meets the doctoral program entrance requirements is expected to take the General Examination in his/her second year of graduate study, but must take the exam by the sixth semester.

The student should have a suitable breadth of knowledge plus an interest in one or more subject areas for quality research. The graduate level computer science courses related to the General Examination are grouped into the following areas (1) to (10).

Area 1: Operating Systems and Computer Architecture

CSC 7103 Survey of Operating Systems
CSC 7080 Computer Systems Architecture

Area 2: Algorithms, Data Structures, and Theory of Computation

CSC 7300 Algorithm Design and Analysis
CSC 4890 Theory of Computing

Area 3: Programming Languages and Compiler Design

CSC 7101 Programming Languages Structures
CSC 4351 Compilers

Area 4: High Performance Computing

CSC 7560 Computational Methods
CSC 7600 Introduction to High Performance Computing

Area 5: Artificial Intelligence/Machine Learning

CSC 7444 Knowledge Engineering
CSC 7333 Machine Learning

Area 6: Database Management/Information Retrieval

CSC 7402 Database Management Systems
CSC 7481 Information Retrieval Systems

Area 7: Robotics

CSC 7374 Computational Models for Mobile Robots
CSC 7275 Robot Vision

Area 8: Software Engineering

CSC 7135 Software Engineering
CSC 7235 Advanced Software Engineering

Area 9: VLSI and Graph Algorithms

CSC 7381 Computational Aspects of VLSI Systems
CSC 7370 Graph Algorithms
CSC 7420 VLSI and Parallel Computation
CSC 7700 Special Topics in VLSI or Graph Algorithms

Area 10: Networking and Systems

CSC 7450 Programming and Performance Evaluation of Parallel Computers
CSC 7540 Distributed Systems

Students are required to take and pass written tests in four areas from areas 1 – 10 with at least three of the areas chosen from areas 1 – 4. Each of these area examinations assumes at least a full year of graduate course work in that area. However, the student is reminded that no such sequence of courses can be expected to prepare him/her adequately for the General Examination. Every student is expected to display a thorough knowledge of the literature in the above areas and to be able to discuss the important theoretical, empirical, and methodological issues in those areas. The role of this examination is to test the breadth of computer science background, but at a depth beyond that of a Masters degree student. Students who fail the written general examination in any area have one opportunity to retake and pass it. On a second attempt, if a student chooses to take a test in a different area than the one failed, then only one chance is given for that new area.

After the written General Examination, a student must formally request the Graduate School for permission to take the oral general examination. This examination requires a dissertation research proposal, and the student will be examined orally by the full committee of four members plus a fifth added by the Graduate School. The student must submit a formal, written proposal of his/her dissertation research to his/her advisory committee at least two weeks before the date of the oral examination.

VIII. Dissertation and Defense

The primary goal of a doctoral program of study is to ensure that the student is able to conduct independent research. For this reason, each student must prepare a dissertation describing original research in computer science and submit it to his/her advisory committee at least two weeks before the oral examination.

The research must focus on a significant problem in the field of computer science. The dissertation research must be of sufficient quality and depth to merit publication of the results in a refereed scholarly journal. A paper describing the bulk of the research should be submitted to such a journal or accepted for presentation at a refereed national meeting of some relevant professional society. The student is also required to give a seminar on the topic for the other students and the faculty.

The student must defend the dissertation research before his/her advisory committee in a public oral examination. The committee is responsible for supervising this examination. Final approval of the dissertation by the full advisory committee (including the fifth additional member appointed by the Graduate School), and approval by the Graduate School constitute completion of the requirements for the doctoral degree.

IX. Departmental Policy

Policy 1: Ph.D. Examinations

The Ph.D. dissertation must be submitted to committee members at least two weeks prior to the final examination date. Failure to follow this policy is sufficient cause for postponement of that date if any committee member so desires.

Policy 2: Announcement of Dissertation exams to the departmental faculty and students

The room, time, and date of the presentation examination must be announced in advance by both e-mail to cscworld and by posting on the bulletin board (at least three working days before the exam). Failure to do so is sufficient cause for postponement of that date if any computer science faculty member raises a complaint.

Policy 3: Graduate Teaching Assistantships

The assistantships are awarded to graduate students for a maximum period of five years, except for special circumstances, to be justified by the students' major professor and the department chair. In general, the assistantship will be automatically terminated at the end of the fifth year.

Policy 4: General Examination

A student who fails any part of the written portion of the General Examination must pass all parts in the next regular semester. A student has only two chances to take the exam. If the student fails both times, he/she will be **dropped** from the program.

Policy 5: Major Professor

A student's major professor for the Ph.D. degree **must** be from the Computer Science Department.

X. Facilities and Equipment

The computational backbone of the department consists mainly of two new state-of-the-art UNIX-based networks of DEC Alpha and SUN UltraSPARC workstations and servers.

The DEC Alpha Network

The DEC Alpha network consists of two 500 MHZ DEC Alpha servers, with 0.5GB of RAM and 2MB of cache each, and 38GB of total disk space. Served by these servers are 15 433MHz DEC Alpha workstations, each with 128MB of RAM, 4.3GB of disk space, and 17" trinitron color monitors. All servers and workstations are running the Digital UNIX 4.0D

operating system, and are used as the main backbone of the department for research, education, Internet, e-mail, etc.

The SUN UltraSPARC Network

The SUN network consists of a SUN Enterprise E450 server and 20 SUN Ultra 5 workstations. The server has two 300MHz UltraSPARC II processors, each with 2MB of cache, and a total of 512MB of RAM and 28GB of disk storage. The Ultra 5 workstations each consists of a 270MHz UltraSPARC Ii processor, 64/128 MB of RAM, 17" color monitors, and 4.3 GB of local disk space. The SUN workstations and servers are running the Solaris 2.6 operating environment. They are mainly used to support Computer Science classes, currently with over 1900 accounts installed. The underlying network consists of a new state-of-the-art 10/100 Mbps switched Ethernet, with a Fiber link to the campus ATM backbone.

Both DEC and SUN systems mentioned above are running the Common Desktop Environment (CDE) Graphical User Interface (GUI).

The Pentium-based Microcomputer NT Network

The department also has a microcomputer network consisting of 20 Gateway 2000 Pentium PCs, and one server, all running the MS Windows NT 4.0 operating system. The network is used mostly for teaching introductory Computer Science classes, and for general use by Computer Science students.

A PC Cluster

The department is in the process of acquiring a cluster of 24 650MHz PCs to be connected via a switched 100Mbps Ethernet network. The cluster will be running MPI and/or PVM in support of research in the area of parallel and distributed computing. Two high-end graphics workstations will be used for front-end visualization. A new Networking and Multimedia lab is being prepared to house this equipment.

Other Equipment

Other equipment currently utilized by the department includes several SUN workstations, DEC AlphaStations, Pentium PCs, Macintosh and PowerPCs, and numerous terminals, scanners, laser and line printers.

In addition to on-site equipment, the department has limited access to a variety of other machines via its connection to the University's backbone network. This equipment includes the computational facilities of the LSU System Network Computer Center (SNCC). SNCC operates an IBM mainframe, an IBM SP2 supercomputer, and several RS/6000 UNIX (AIX) workstations and servers. Many computers on campus are also available for use, especially in the public labs funded by the student technology fee. Finally, the PAWS (Personal Access Web Services) system

provides all LSU students and faculty with e-mail accounts, web services, and resources for instruction.

Specific research equipment is also utilized in the different Research Laboratories.

Computer Accounts

The department of computer science provides its graduate students and undergraduate junior and senior majors with permanent computer accounts for e-mail and web services. The accounts can be used by the students as long as they are students in the department. Please refer to the Account Initiation and Termination Policy for details.

XI. Faculty and Research Areas

Bert R. Boyce, Adjunct Professor; Ph.D., Case Western Reserve University;
Information and Library Sciences

Doris L. Carver, Professor; Ph.D., Texas A & M University;
Software engineering, formal requirements and specification techniques, programming environments, object oriented development methodologies

Jianhua Chen, Associate Professor; Ph.D., Jilin University (China);
Artificial intelligence, machine learning, database systems, logic programming

Peter P. Chen, LSU Foundation Murphy J. Foster Distinguished Chair Professor;
Ph.D., Harvard University;
Models of data representation for databases, office automation, knowledge-based systems

Jerry P. Draayer, Adjunct Professor; Ph.D., Iowa State University;
Scientific computing

S. Sitharama Iyengar, Professor and Chairman; Ph.D., Mississippi State University;
Parallel algorithms, data structures, algorithmic complexity, robotics, and computer vision

J. Bush Jones, Professor; Ph.D., Southern Methodist University;
Numerical analysis, scientific and high performance computing, algorithm design

Rajiv K. Kalia, Professor; Ph.D., Northwestern University;
Computer simulation of disordered systems, structural and dynamical correlations in glasses and molten systems, phase transformations

Rajgopal Kannan, Assistant Professor; Ph.D., University of Denver;

Computer networks (ATM, optical networks, internet multicasting and transport protocols), wireless & packet radio networks, interconnection networks, computer architecture, parallel and distributed systems.

Donald H. Kraft, Professor; Ph.D., Purdue University;

Information retrieval systems, artificial intelligence, algorithms, graph theory

Sukhamay Kundu, Associate Professor; Ph.D., University of California at Berkeley;

Database systems, artificial intelligence, algorithms, graph theory

Aiichiro Nakano, Associate Professor; Ph.D., University of Tokyo;

Parallel algorithms for scientific computing, computational materials design, computational electronics

Louise Perkins, Associate Professor; Ph.D., University of California at Davis;

Numerical approximations, computational oceanography, software engineering, communication architectures for distributed computing

Steven Seiden, Assistant Professor; Ph.D., University of California at Irvine;

Design and analysis of algorithms, data structures

John M. Tyler, Professor; Ph.D., Louisiana State University;

Parallel and vector algorithms, scientific high performance computing, numerical analysis, simulation and modeling

Priya Vashishta, Cray Research Professor; Ph.D., Indian Institute of Technology;

Materials simulation on supercomputers, algorithm development on highly parallel computers

XII. Admission Requirements

Regular admission to the Ph.D. program requires a comprehensive computer science background, a satisfactory grade point average (in general, at least 3.0), satisfactory performance on the Graduate Record Examinations (in general, at least 600 on quantitative, 1250 combined verbal-quantitative), proficiency in English (in general, at least 550 in TOEFL for foreign students residing outside U.S.A.), strong recommendations and a proven research track record.

Consideration will be given to applicants who fail to meet one or more of these requirements but show outstanding promise in other ways. Foreign students residing outside the U.S.A. should furnish their TOEFL scores. TOEFL is an essential part of the foreign student application. It must be satisfactorily passed in order to be eligible for admission to graduate school in Computer Science. An acceptable TOEFL score is in general at least 550 (600 to be considered for a graduate assistantship).

XIII. Deadline for Application for Admission

Applications for admission to the Ph.D. program should be submitted as early as possible in the academic session immediately preceding the one in which admission is sought. Because of the large enrollment in the computer science department, the following deadlines are observed to allow careful evaluation of applicant's requirements for admission to the Ph.D. program. All materials must be received by the Department by the deadlines listed below.

Deadlines for admission to the Fall semester	February 1 st
Deadline for admission to the Spring semester	October 1 st

XIV. Financial Aid for Graduate Students

Students who have been admitted automatically will be considered for financial assistance. All financial assistance is awarded on an annual basis, and no award implies automatic renewal from year to year.

XV. More Information

For further information about the Ph.D. Program in Computer Science and departmental assistantships, contact:

Professor S. Sitharama Iyengar, Chairman
Department of Computer Science
Louisiana State University
Baton Rouge, Louisiana 70803-4020
Phone: (225) 578-1495 Fax: (225) 578-1465
E-Mail: iyengar@bit.csc.lsu.edu

To obtain more information about the following items, write or call the office listed.

Graduate Applications and Fellowships:

Office of Graduate Planning
The Graduate School
Louisiana State University
Baton Rouge, Louisiana 70803-3804
Phone: (225) 578-1641 Fax: (225) 578-2112

Admission Procedures and Requirements:

Office of Graduate Admissions
The Graduate School
Louisiana State University
Baton Rouge, Louisiana 70803-3804
Phone: (225) 578-2311 Fax: (225) 578-2112

International Students:

International Services Office
Johnston Hall
Louisiana State University
Baton Rouge, Louisiana 70803
Phone: (225) 578-3191
Fax: (225) 578-4820

Student Loan and College Work-Study:

Office of Student Aid & Scholarships
202 Himes Hall
Louisiana State University
Baton Rouge, Louisiana 70803-3701
Phone: (225) 578-3103
Fax: (225) 578-6300

Housing:

Department of Residential Housing
99 Garig Hall
Louisiana State University
Baton Rouge, Louisiana 70803-6903
Phone: (225) 578-8663
Fax: (225) 578-5225