UNIVERSITY OF RHODE ISLAND

The Graduate School

Ph.D. in Computer Science

At Meeting No. 400 held on 4 February, 2005, the Graduate Council approved the following proposal that is now submitted to the Faculty Senate.

SECTION I

BACKGROUND INFORMATION

ABSTRACT

The Graduate Council approved a proposal from the Department of Computer Science and Statistics to offer the Ph.D. degree in Computer Science. The proposed Ph.D. program will augment a solid existing M.S. program in Computer Science that graduates from 10 to 15 students per year. The department states that the program will enhance both the research and teaching mission of the department by attracting graduate students of high quality. The Graduate Council deemed the program to be of significant merit, and it is forwarded to the Faculty Senate in a

category for programs of merit that require no new funding

resources.

BACKGROUND

Programs similar to that described in the proposal are said to exist in every state university system in the country except Rhode Island. The program is seen to fill deficiencies in the availability of trained computer science researchers and advanced developers that are an impediment to the state-targeted development of a sustained, productive software industry now and in the future. The proposed Ph.D. degree will complement an existing Ph.D. degree in Applied Mathematical Sciences (AMS) with which the Computer Science Department has participated for over 15 years. Because of the existing M.S. program in Computer Science and the participation of the Department of Computer Science in the AMS Ph.D., the proposed Ph.D. program is offered as a no-cost extension of existing programs.

The proposal was reviewed under the process established by the Faculty Senate in which the Graduate Council serves as the Coordinating and Review Committee. Announcements of the receipt of the proposal were sent to the Provost and the Council of Deans, the Budget Office, and Department Chairs and Directors. Recommendations were sought from each of these, and the comments received are appended. Comments and recommendations have been kept on file in the Graduate School.

The Budget Office responded with the understanding that no additional

resources would be required for implementation of the program. Citing

the prospect that the proposed degree would allow students to Òfind Ó

the program more easily, the Council of Deans unanimously endorsed

the proposal.

SECTION II

RECOMMENDATION

The Graduate Council approved the proposal for the Ph.D. degree in Computer Science at its meeting number 400 held on 4 February, 2005, and forwards it to the Faculty Senate in a category for programs of merit that require no number 400 held on 4 February, 2005, and forwards it to the Faculty Senate in a category for programs of merit that require no new funding resources.

The University of Rhode Island

Department of Computer Science and Statistics

Proposal for a Ph. D in Computer Sciences

1. Name of institution: University of Rhode Island

2. Name of department and college: Department of Computer Science and Statistics, College of Arts and Sciences

3. Title of program: Ph.D. in Computer Science

4. Intended initiation date of program change and anticipated date for granting first degrees or certificates: Initiation as soon as possible, first degrees within one year following approval (due to transfers from existing programs).

5. Intended location of program: URI, Kingston

6. Description of institutional review and approval process.

	DATE APPROVED
Department	March 3, 2003
College of Arts and Sciences	May 10, 2004
Graduate Council	February 4, 2005
Faculty Senate	
President of the University	

7. Summary

This proposal seeks to establish a Ph.D. in Computer Science at the University of Rhode Island. Similar programs exist in every state

university system in the country except Rhode Island. This program is

essential to fill gaping deficiencies in trained computer science

researchers and advanced developers that are a well-known

impediment to the state-targeted development of a sustained,

productive software industry now and in the future.

The program is consistent with URI's teaching and research mission. It will improve the research mission by attracting better computer science graduate students. These better students will themselves perform better research while at URI, will allow the URI Computer Science Department faculty to do better, more advanced research, and will generate trained researchers many of whom will stay in the state to continue the cycle of improved computer science research state-wide. It will improve URI's teaching mission by attracting better graduate students who can teach or assist in teaching undergraduate courses, and by generating critical mass that will allow a richer, more in-depth selection of graduate computer science courses. Overall it will impact URI's mission of supporting the state of Rhode Island by addressing at the highest level the well-known deficiency in trained computer scientists that the state needs.

This proposed Ph.D. program will augment a flourishing existing Master of Computer Science program at URI that graduates ~10-15 students every year. The proposed Ph.D. degree will also complement a Ph.D. in Applied Mathematical Sciences (AMS) program in which the Computer Science department has participated for over 15 years as an inadequate, but expedient, substitute for a Computer Science Ph.D. program. Currently, students who wish a research degree in Computer Science at URI must pursue an Applied Mathematics course curriculum - which is a significant obstacle in attracting and retaining good Computer Science students. The relation of the proposed Computer Science Ph.D. program to the current AMS Ph.D. program is described Section C2, the deficiencies of the current AMS program in supporting URI's mission in the area of Computer Science is detailed in Section B2.

Due to the Department's current participation in the AMS Ph.D. program and the existence of a strong Master's program, this proposed establishment of a Ph.D. in Computer Science should be a no-cost extension that serves the university and state better. Because the department already offers the A.M.S. Ph.D. curriculum, no new courses will be required, nor will there be any need for new resources for research, since these are already in place to support the department's current programs. In sum, this proposed new program will attract better students and will enable better training of the students that come to URI by allowing them to focus fully on computer science learning and research.

8. Signature of the President: _____

9. No additional resources are required for this program.

10. Name of Person(s) to contact during the review:

Name: Dr. James Kowalski

Title: Chair, Dept. of Computer Science and Statistics

Telephone: 401-872-2701

Email: kowalski@cs.uri.edu

1. Program Objectives

The objective of this program is to establish a doctoral degree in Computer Science at the University of Rhode Island. Every state university system except Rhode Island has such a program; indeed, as does nearly every medium size or larger Ph.D.-granting university in the country. The degree would allow graduate students to gain an important credential by taking advanced, in-depth computer science courses and learning computer science research techniques. The program would attract high-quality students, assist in producing high-quality research results, and produce high-quality trained researchers and software developers.

2. Needs Addressed By Program

Rhode Island has a well-documented shortage of software developers and designers. It is also the only state in the nation whose state university system does not offer a Ph.D. in Computer Science**.**

The URI Computer Science Department currently has the course content, research infrastructure, and faculty skill and desire to produce significant research results and skilled computer science researchers, but has difficulty attracting graduate students due to a lack of a Computer Science Ph.D. program.

The current graduate degrees offered by the URI Computer Science Department--a Masters in Computer Science and a Ph.D. in Applied Mathematic Sciences--are reputable, solid programs, but inadequate for current and future needs. These programs are detailed in Section C2. The Computer Science Master's degree program is strong, but is a program, by its definition, that does not foster advanced research or the development of advanced researchers. The AMS Ph.D. is a multi-disciplinary program that has been used by the Computer Science department as an expedient substitute while the department obtained the "critical mass" necessary for its own Ph.D. program, something which has now happened. The AMS Ph.D. program has produced some trained computer science researchers over the 15+ years of its existence, but the program is not adequate in meeting the objectives in Section B1. First, it is not attractive to many good, potential computer science graduate students who want to study computer science, as opposed to applied mathematics, and want to have "Computer Science'' in their degree title. Second, the AMS program is administered by a committee comprised of faculty from many diverse departments, not by computer science faculty. Finally, the course requirements in the AMS program require many courses outside of or unrelated to computer

science--a fact that can detract from a computer science graduate student's intended focus of study.

The program proposed here would address these needs by creating a bona fide Ph.D. in Computer Science that would attract better computer science graduate students, allow them to focus better on computer science education and research, and in the end produce better computer science research results and better computer science researchers.

C. Institutional Role

1. Consistency with the role and mission

A Ph.D. program in Computer Science is consistent with URI's teaching mission, research mission, and mission in supporting the state's economic development. It will improve the research mission in several ways: by attracting better graduate students that will support a talented faculty in producing computer science research results. It will improve URI's teaching mission by attracting better graduate students that will teach and assist in teaching undergraduate courses, and by continuing to generate critical mass that will allow a richer, more in-depth selection of graduate computer science courses. Overall it will impact URI's mission of supporting the state of Rhode Island by addressing at the highest level the well-known deficiency in trained computer scientists that the state needs, and by producing research results that will transition to bolster Rhode Island's software industry.

2. Relationship to other programs offered by the institution

The University of Rhode Island currently offers two programs related to the proposed Ph.D. program. The first of these is the computer engineering specialization of the Ph.D. in electrical engineering. Similarities between that program and the one proposed here, however, are only superficial. The two different programs appeal to students with significantly different backgrounds, their banks of courses share minimal overlap, and they target completely different domains of application: hardware and digital devices versus software and algorithms. Consequently, the proposed program will

have minimal or no effect on the existing Ph.D. program in electrical engineering.

The situation is significantly different with respect to the other related Ph.D. program offered at URI, i.e., the Applied Mathematical Sciences Ph.D. program. This program is sponsored by the Departments of Computer Science and Statistics, Industrial and Manufacturing Engineering, Management Science, and Mathematics. As mentioned earlier, the AMS. Ph.D. program is the only Ph.D. program with computer science content that is currently available to computer science graduate students. As of Fall, 2004, there are a total of 10 students in the AMS Ph.D. program: 5 in the computer science track, 3 in the applied math track, 1 in the operations research track, and 1 in the statistics track. At least 4 of the 5 in the computer science track would prefer to be in a pure CS Ph.D. program. In the future, we can expect that most students interested in computer science will enter the CS Ph.D. program rather than the AMS program. It is therefore unavoidable that the creation of the proposed program will likely result in a reduced enrollment in the A.M.S. Ph.D. program. However, this fact contributes to the no-cost claim made in this proposal.

However, it is expected that the new program will not simply drain students from the AMS program, it will attract new students. As explained earlier, a significant number of prospective Ph.D. students, including students enrolled in or recently graduated from the M.S. in Computer Science program, have the required background for the A.M.S. Ph.D. program, but nevertheless decide not to join this program, either because the course requirements deter them or simply because they desire a true Computer Science degree. Thus, we expect to attract some of these students who either go elsewhere or decide not to pursue the a Ph.D. at all. We also believe that the proposed program will appeal to students with different backgrounds (e.g. biology or music), just as the M.S. in computer science program does. Moreover, with improved research due to better students, the ability of the faculty to attract outside funding will be enhanced, which, in turn, will provide for more (and better) supported Ph.D. students.

In summary, it is expected that the proposed Ph.D. program will increase the overall number of Ph.D. students in computer science-related fields, by retaining students who are enrolled in the M.S. in computer science program, but also by attracting students who would not apply for the current AMS. Ph.D. program.

D. Inter-institutional Considerations

1. Similar programs offered in the state and the region

No other Rhode Island state institutions offer a similar program - making Rhode Island the only state in the country without a Computer Science Ph.D. program in its state supported higher education system.

Table 1 displays the core requirements for the Ph.D. program at some of these state institutions. (Table 1 s available on the web at http://www.uri.edu/facsen/5A_Table1.pdf)

2. Projected impact on other state institutions in Rhode Island

This program will have no effect on other state institutions in Rhode Island because no other state institution offers a Ph.D. in Computer Science.

3. Provision for transfer students from RI

There is no provision for transfer students from other RI institutions because no other state institution offers a Ph.D. in Computer Science.

4. Cooperative arrangements

None

5. External affiliations

None

6. New England Board of Higher Education

This program will not be available to students under the New England Board of Higher Education (NEBHE) Regional Student Program (RSP) as every other state institution already has a Computer Science Ph.D. program.

E. Description of the Program

1. Summary of the program

Requirements for the proposed program fall into these categories:

⊙ Course requirements,

⊙ Comprehensive examination,

⊙ Presentation requirement,

⊙ Dissertation and final oral examination.

Normal course requirements and examination policies of the Graduate School apply to all components of the proposed program.

Course Requirements. A student with a Bachelor's degree in computer science or in a related area can pursue directly the Ph.D. degree; however, the program has been designed primarily for students who already have an M.S. degree in computer science.

The student must complete 54 credits of course work beyond the Bachelor's degree in addition to 18 credits for the doctoral dissertation. Courses that are normally required in the U.R.I. undergraduate curriculum corresponding to the student's B.S. program may not be applied toward the 54 credits of course work.

A student entering the program with an M.S. degree in computer science or in a related area may be granted up to 30 credits towards the Ph.D. in Computer Science.

The following list identifies five core areas, subdivided into eleven overlapping domains. The student will be required to select at least one course in each of domains A1, A2, B1, B2, C, and D, and courses in at least two different domains of core area E, for a total of eight different courses. No single course can be used to satisfy two different domain requirements. Course prerequisites will be strictly enforced to guarantee that the student effectively masters the material of the core areas. (Some courses from other departments such as Computer Engineering and Mathematics are appropriate for addition to these categories and will likely be added soon after the program begins. However, at the time this proposal was prepared and initially approved by the department, only departmental courses were explicitly considered.)

A: Algorithms and Theory

   A1: Algorithms

      CSC 440, Algorithms and Data Structures

      CSC 541, Advanced Topics in Algorithms

      CSC 542, Mathematical Analysis of Algorithms

      CSC592T Advanced Algorithms for Geometry and Graphics

   A2: Theory of Computation

      CSC 445, Models of Computation

      CSC 544, Theory of Computation

      B: Architecture and Systems

   B1: Computer Architecture

      CSC 411, Computer Organization

      CSC 415, Introduction to Parallel Computing

CSC 511, Advanced Computer Organization

CSC 517, Design and Analysis of VLSI Systems

B2: Computer Systems

CSC 412, Operating Systems and Networks

CSC 512, Topics in Distributed Systems

CSC 519, Computer Networks

C: Programming Languages

CSC 402, Compiler Design

CSC 501, Programming Language Semantics

CSC 502, Theory of Compilers

D: Software Design

CSC 505, Software Engineering

CSC 509, Object-oriented System Design

CSC 592S, Bioinformatics

E: Applications

E1: Databases

CSC 436, Database Management Systems,

CSC 536, Topics in Data Management Systems,

CSC 592U, Data Mining

E2: Distributed Computing

CSC 415, Introduction to Parallel Computing,

CSC 511, Advanced Computer Organization,

CSC 512, Topics in Distributed Systems,

E3: Graphics and Visualization

    CSC 406, Computer Graphics

    CSC 592R, Computer Graphics -- Scene Modeling and Rendering

    CSC 592T, Advanced Algorithms for Geometry and Graphics

    CSC 583, Computer Vision

E4: Intelligent Systems

    CSC 481, Artificial Intelligence

    CSC 581, Special Topics in Artificial Intelligence

    CSC 583, Computer Vision

    CSC 592U, Data Mining

E5: Mathematical Computation

    CSC 525, Simulation

    CSC 550, Computer Algebra

    CSC 547, Combinatorics and Graph Theory

    CSC 548, Topics in Combinatorics

Students are also required to take two credits of Computer Science Research Seminars. Other courses must be selected in order to meet the 54-credit minimum and will be selected in consultation with the student's Advisor or Major Professor. They are not required to be from among those appearing in the above list.

Comprehensive examination. The student must take a comprehensive examination, which is composed of a written examination and an oral examination. The comprehensive examination committee will consist of the student's Major Professor and two other members of the graduate faculty (one of which should represent a field of study related to that of the student's major)

⊙ *Written Exam:* The written examination, which will be held at least once a year, covers core areas A, B, C, and D listed above. Success in the written examination is conditional on obtaining passing grades in all core areas, and is a prerequisite for being allowed to take the oral examination. Typically, it would be expected that a student take the comprehensive examination within a year to two years after joining the program. A student may not take the comprehensive examination after being in the program for six months or less.

⊙ *Oral Exam:* The objective of the oral examination is for the student to present an intended research program and demonstrate satisfactory knowledge and understanding of the scientific literature of the corresponding research domain. For this purpose, prior to the oral examination, the student will submit to the comprehensive examination committee: (1) the text of a research proposal and (2) bibliographies for three research domains related to that of the intended research project. Following the presentation of the intended research project, the student will be interrogated by the comprehensive examination committee on this project and on its background bibliography.

Unanimous approval by the comprehensive examination committee is required for passing. A candidate whose performance fails to receive unanimous approval may, with the recommendation of the committee and the approval of the Graduate School, be permitted one re-examination, to be taken no sooner than four months and no later than one year after the initial examination.

Presentation requirement. Although students enrolled in the program will be encouraged to teach a course for at least one semester, not all entering students intend to undertake a career in academia. This program will therefore not make such a teaching experience mandatory.

On the other hand, whether the student intends to undertake a career in academia or in the industry, the ability to present and communicate well the material in one's field of expertise is an essential skill for a Ph.D. candidate. Therefore all students enrolled in the program must have done

at least two presentations in the regular department research seminar series prior to defending his or her Ph.D. thesis.

The following two pages present two different sample programs of study to show how a student may fulfill the course requirements of the program. All of the courses mentioned, with the exception of CSC 5xx: Research Seminar, are already in place and are offered regularly, some once a year, some once every other year, in order to support our active M.S. program and the computer science track of the AMS Ph.D program.

It should be mentioned that beginning with the 2004-05 academic year, the department is undertaking a complete curricular review at the graduate and undergraduate levels, partly in response to a decision to seek ABET program accreditation for the undergraduate programs, partly to respond to Board of Governors' mandate to implement assessment procedures with programs, and partly as a normal periodic curricular review. Some curricular changes are expected but at this point it appears they will be relatively modest. (See
http://www.uri.edu/facsen/5A_Sample_programs.pdf

F. Faculty and Staff

1. Present Faculty

The percentage of time in the program listed for each faculty member reflects time spent on administration, graduate student supervision, and a portion of research. Note that this proposed Ph.D. program is a no-cost proposal - these percentages reflect time that the faculty already spends on similar tasks in the MS Program and AMS Ph.D. program, which will be replaced by work in the Computer Science Ph.D. program.

Gerard Baudet, Ph.D. in Computer Science, Carnegie Mellon University, Associate Professor (tenured). Design and analysis of VLSI systems, Computer architecture, Parallel algorithms, Educational software. Percent of time spent in proposed program: 15%-20%

Lisa Cinsiger DiPippo, Ph.D. in Applied Mathematical Sciences, University of Rhode Island,Assistant Professor (non-tenured). Real-time object-oriented systems, Database systems, Distributed systems Percent of time spent in proposed program: 20%

Victor Fay-Wolfe, Ph.D. in Computer Science, University of Pennsylvania,Professor (tenured). Distributed computing, Object-oriented methodologies, Real-time computing, Sensor networks, Computer Forensics, Computing concepts for general education. Percent of time spent in proposed program: 20%

Lutz Hamel, Ph.D. in Computer Science, Oxford University, UK. Assistant Professor (non-tenured). Data mining, Database management, Artificial intelligence. Percent of time spent in proposed program: 20%

Timothy Henry, Ph.D. in Applied Mathematical Sciences, University of Rhode Island, Lecturer (non-tenured). Computer graphics, 3D modeling, and animation, Virtual and augmented reality, Sensor networks. Percent of time spent in proposed program: 20%

Jean-Yves HervŽ, Ph.D. in Computer Science, University of Maryland Assistant Professor (non-tenured). Computer vision, Robotics, Virtual and augmented reality, Simulation, Computer graphics. Percent of time spent in proposed program: 20%

James G. Kowalski, Ph.D. in Philosophy, University of Notre Dame, Professor (tenured) and chair. Expert systems, Artificial intelligence applications, Machine learning, Neural networks. Percent of time spent in proposed program: 20%

Edmund A. Lamagna, Ph.D. in Computer Science, Brown University, Professor (tenured). Symbolic and algebraic computation, Design and

analysis of algorithms, Programming languages, User interfaces. Percent of time spent in proposed program: 20%.

Joan Peckham, Ph.D. in Computer Science, University of Connecticut Professor (tenured). Database systems, Semantic modeling, Active databases, Object-oriented design, Bioinformatics. Percent of time spent in proposed program: 20%.

Adjunct: Miguel Encarnacion, Ph.D. in Computer Science, the University of Tubingen, Germany Center for Research in Computer Graphics, Inc., Fraunhofer Institute, Providence, RI. Computer graphics, Virtual reality, Design and analysis of algorithms. Percent of time spent in proposed program: 5%

Adjunct: Peter Stephenson, Ph.D. in Computer Science, University of North Queensland, Australia Center for Research in Computer Graphics, Inc., Fraunhofer Institute, Providence, RI. Computer graphics, Virtual reality, Design and analysis of algorithms. Percent of time spent in proposed program: 5%

Proposed Faculty. Over the past five years, the Department of Computer Science added two full-time, tenure track faculty as part of a growth plan agreed to by the Provost. Unfortunately, we have had a retirement and a resignation during the same period, with one of the positions now being held by a full-time lecturer who participates actively in the research programs of the department. We also have active research, teaching, and mentoring contributions provided by our adjunct faculty. All in all, we have sufficient faculty at present to support this program; indeed, our present faculty are supporting the needs of the 5 students currently in the computer science track of the AMS Ph. D. program. Thus, no new faculty are required to implement this program. However, we would expect to add faculty slowly, perhaps initially as research faculty, as the program develops and grows.

2. Anticipated Support Staff

The department currently has two full-time secretaries and has a staff of undergraduate and graduate students who serve as computer systems administrators to oversee our extensive computer facilities. One research group (Real -Time and Distributed Systems) funds a system administrator/programmer and a part-time financial administrator from research awards. Another research group (3D Graphics Modeling and Animation) funds another system administrator/programmer) from their research awards. The new program will not immediately require additional support staff. With the expected growth in funded research, additional support staff (funded from research awards) may become necessary, but this will not impact the department's unrestricted budget.

3. Cost Summary

This proposed program would require no additional faculty or support staff costs. The Department of Computer Science already offers a full and adequate selection of graduate courses for its MS in Computer Science and for the Computer Science concentration in the AMS Ph.D. Program. The Department also already has a Graduate Committee that administers these programs. The proposed Ph.D. program is expected to replace faculty and staff effort in these existing programs - thus yielding no additional cost. In addition, it is expected that increased quality of research will attract external funding that will increase revenue. That is, any additional effort will be self-supporting from external funding, and in fact will be revenue-generating.

G. Students

1. Potential Students

Potential students will come from several sources. Students with Master's degrees in Computer Science---both from URI and elsewhere---will be the primary source for the program. Our current Master's program in Computer Science will provide a good pool of students. Many of our graduate students are international students who choose to obtain a Master's degree in Computer Science at URI because of the department's reputation in several important research areas. This reputation will also attract international students to the Ph.D. program. It is expected that some

of our existing Ph.D. students in the Applied Mathematical Sciences (AMS) program will transfer to the Computer Science Ph.D. program. This change will not necessarily affect the research that the student may undergo, but the course requirements will clearly be different. While the new program will likely draw some students away from the AMS Ph.D. program, these are students that have chosen to do their Ph.D. studies at URI because of the research being performed by the faculty, probably not because of the AMS Ph.D. program.

2. Estimated program size

Once the program is up and running for a few years, it is estimated that it will have approximately 10-20 students in some phase of the program. This estimate is based on the number of faculty in the department, with each faculty member advising approximately 1 or 2 students.

3. Admission and retention requirements

A student with a Bachelor's degree in computer science or in a related area may be admitted to this Ph.D. program; however, the program has been designed primarily for students who already have an M.S. degree in Computer Science.

The GRE general test is required. A subject (advanced) test in computer science or a related field is not required, but, if submitted, may be considered by the admissions committee.

Background requirements for admission to the program are B or higher grades in courses equivalent to the following:

- CSC 211, Introductory Programming and Design,

- CSC 212, Data Structures and Abstractions,

- CSC 301, Fundamentals of Programming Languages,

- CSC 305, Software Engineering,

- ⊙ CSC 340, Mathematical Foundations of Computer Science,

- ⊙ MTH 141, Introductory Calculus with Analytic Geometry,

- ⊙ MTH 142, Intermediate Calculus with Analytic Geometry,

- ⊙ MTH 215, Introduction to Linear Algebra,

- ⊙ MTH 243, Calculus for Functions of Several Variables.

Applicants with course deficiencies may be required to take appropriate undergraduate courses, for no program credit, and to demonstrate, by their performance in such coursework, basic knowledge of the subject matter in the area(s) of deficiency.

In conformity with Graduate School requirements, students are expected to maintain a cumulative average of B or higher and to receive passing grades in all their courses (B- or higher for a 400-level course and C or higher for a course at the 500 and 600 levels). In addition, as specified in Section E, continuation of status is conditional on the passing, within the specified time limits, of the qualifying examination (if required) and of the comprehensive examination.

4. Scholarships and fellowships

The Computer Science department currently has 9 teaching assistantships available for graduate students, both in the Master's degree program and the AMS Ph.D. program. It is anticipated that the department will have at least as many assistantships when the Computer Science Ph.D. program is available. The department will give preference to

Ph.D. students when offering assistantships in order to attract good students and retain them. Other sources of support will come from research grant funds and projects in other departments that require students with computer expertise. Currently the Computer Science Department supports 8 students on Research Assistantships.

Currently, the Computer Science Department has Sloan grant funding for supporting several minority Ph.D. students. This funding has gone unused for several years in great part due to the lack of a bona fide Ph.D. in program in Computer Science to attract the minority students.

H. Administration

1. Administrative Structure

The degree will be administered by the Computer Science Graduate Committee, which is presently comprised of four Computer Science faculty members. The proposed Ph.D. program will have a negligible impact on the roles and duties of this administrative structure. The Graduate Committee already administers most aspects of the AMS Ph.D. program for students who have indicated an interest in Computer Science, as well as all aspects of the program for the Computer Science Master's degree students. Current AMS Ph.D. students whose Major Professor is a Computer Science faculty member and whose expressed interest is Computer Science, have their applications reviewed by this committee, have their progress tracked by this committee, and have most issues resolved by this committee. We anticipate the number of graduate students in the department to increase only slightly due to the new Ph.D. program (instead the primary ramification will be a shift of Ph.D. students from the AMS Ph.D. program, which we currently administer anyway, to this new program).

2. Persons having administrative responsibility for the program

The Department Chair will have overall administrative responsibility for this program and will be assisted by the Department's Graduate Committee. Administering graduate programs requires no more than one or two hours per week in average. Thus it seems reasonable that less than 5% of the chair's time and that of the CS graduate committee members will be spent on this program. More importantly, the increase in time over that already spent on administering Computer Science graduate programs would be essentially zero because this effort will be in lieu of similar effort on the AMS Ph.D. program administration.

3. Administrative and related costs

As noted above, we expect essentially zero additional administrative costs over what we already have because this effort will be in lieu of similar effort on the AMS Ph.D. program administration.

I. Instructional Resources

1. Library materials

Existing materials currently used to support computer science research performed by our AMS Ph.D. students are adequate to support our proposed Computer Science Ph.D. program. These library resources are currently supplemented by a small departmental library, and by the faculty's own private subscriptions to the major professional journals.

2. Other instructional resources and equipment

Existing resources used to support our AMS Ph.D. program are adequate to support the proposed Computer Science Ph.D. program.

J. Facilities and Capital Equipment

No new facilities or capital equipment are necessary.

K. Financial Considerations

1. Expenditures

As we have described, there are negligible new expenditures will be required for the Ph.D. program since resources are already in place to

support the DepartmentÕs existing MS program and computer science track in the AMS Ph.D. program.

2. Revenue Estimates

The table below shows the department's rough estimates of additional revenue expected to be generated by the program. The additional revenue will come from two distinct and separate sources: 1) revenue from tuition and fees paid by students not supported in any way by University teaching or research assistantships and 2) revenue derived from increased external funding facilitated or made possible by the exisitence of a true computer science Ph.D. program at the University.

The first category of revenue comes from students who will be supported by their employers or will pay their own way. We assume that two such students will enter the program annually beginning in the second year. This revenue is shown in the top part of the table. (Tuition amounts are based on estimates provided by the Office of the Provost.)

The second category of revenue is based on the assumption that the presence of a true computer science Ph.D. program will enable us to better compete for and be awarded increased external research funding. The department already has had some success (~$1 million in 2004-05) in winning research awards. We assume that we will be able to win additional funding (over present levels) of $150,000 in the second year of the program and will be able to increase that at a rate of $150,000/year over the first few years of the program. This seems conservative since the two faculty members currently supporting AMS Ph.D. candidates themselves bring in over $300,000 in grants and contracts per year. At any rate, the assumed increased grant awards are shown as a lump sum in the line of the table labeled "Grants and Contracts."

Additional Revenue Estimates Table
(See http://www.uri.edu/facsen/5A_Additional_Revenue_Est.pdf)

Budget Summary. The budget indicates negligible new expenditures and estimates approximately one million dollars in additional revenues to the university over the first four years of the new Computer Science Ph.D. program.

3. Resources redeployment and external resources

As mentioned earlier, the proposed Ph.D. program will draw some resources from the existing MS in Computer Science and the Computer Science DepartmentÕs participation in the AMS Ph.D. program. The new program is expected to enhance the capacity of the faculty to do research and obtain grants, which will provide support for graduate students and additional revenues to the university.

L. Evaluation

1. Evaluation during the first program cycle

Initial evaluation of the program will be based on the following considerations:

⊙ The number of students who join the program;

⊙ The shift from the number of students currently enrolled in the A.M.S. Ph.D. program and supervised by computer science faculty, to the number of students enrolled in our proposed Ph.D. program in Computer Science;

⊙ How our students are doing in the marketplace 2 years after graduation;

⊙ Increase in external funding.

We will also suggest an external evaluation at the completion of the first 4 years of the program, at the expected graduation of our first Ph.D. students. The evaluation will be conducted by a committee whose members are from peer universities.

In addition, the proposed program will be subject to the periodic internal program review process required by the university.

2. Specialized accreditation

There are currently no accreditation boards for Ph.D. programs in computer science.