Request for Authorization to Establish a
Doctor of Philosophy in Computer Science program
at North Carolina A&T State University

North Carolina A&T State University requests authorization to establish a Doctor of Philosophy in Computer Science degree program (CIP 11.0701).

Program Description
The Ph.D. in Computer Science degree program will combine computer science fundamentals and theories of computing with practical knowledge and technical excellence in advanced technologies. Students will encounter computing problems from a variety of sectors (business, environment, healthcare, law enforcement, etc.) as they develop the ability and skills to identify research problems in computer science; design, develop and analyze software; and serve as effective educators in the field. The program has three areas of focus that align with departmental strengths in information security, distributed systems, and artificial intelligence. Students will be required to complete 72 credit hours of coursework beyond the baccalaureate degree: 18 hours of required core courses including advanced operating systems, and design and analysis of algorithms; 6 hours in a primary concentration area and 3 hours in a second one (information security, distributed systems, and artificial intelligence); 15 hours of other electives agreed upon with advisor; 12 hours of doctoral qualifying exams and supervised teaching; and 18 hours of dissertation.

Mission Relevance
The Ph.D. in Computer Science aligns with NC A&T's mission to pursue excellence in a comprehensive range of academic disciplines. The program directly aligns with several goals of the strategic plan, *A&T Preeminence 2020*, particularly the goal of positioning the university as a national premier research-intensive, doctoral, science and technology-focused learning institution.

Student Demand
The bachelors and master's programs in computer science at NC A&T will serve as pipelines for the proposed program; NC A&T graduates approximately 30 B.S. and 18 M.S. students annually. NC A&T surveyed undergraduate and graduate students in computer science in Fall 2012 regarding their intention to pursue a Ph.D. in computer science and, specifically, to pursue the degree at NC A&T. Of those responding (105 undergraduates and 33 graduate students), 37% of undergraduates and 39% of graduate students expressed intent to pursue the program. NC A&T has also received letters of support from thirteen computer science departments at other Piedmont Triad institutions and at Historically Black Colleges and Universities with baccalaureate or master's computer science programs who are interested in directing their students to the NC A&T program for advanced study.

Societal Demand and Opportunities for Program Graduates
The Bureau of Labor Statistics projects employment growth for doctoral-trained computer scientists at 19% from 2010-2020, which exceeds average growth for all jobs (14%). Graduates of NC A&T's existing master's program in computer science are employed at major corporations and agencies such as Lockheed Martin, IBM, Nortel, Raytheon, Verizon, Caterpillar, Cargill, Intuit, Cisco, General Electric, General Dynamics, Motorola, the NSA, NASA, the CIA, and others. Graduates of the doctoral program are expected to similarly realize a broad spectrum of employment opportunities. External reviewers of the program also confirmed the high demand for their own Ph.D. trained graduates in computer science. The proposed program is also expected to make a significant contribution to the training of African-American computer scientists and will be the only Ph.D. in Computer Science offered by a public HBCU.

National Science Foundation (2008) and Computing Research Association studies show that African-Americans comprise less than 2% of total computer science Ph.D. enrollment and recipients at American universities each year.

Resource Implications
Existing personnel, library, facilities, and information technology resources are adequate for the launch of the program.

New resources for graduate assistantship support are required to launch the program and will largely be funded through extramural awards. Department faculty have current active extramural awards totaling over $17 million, a significant portion of which can be used to support master's and new doctoral students. The addition of doctoral students to the department is anticipated to further increase extramural funding levels and available funds for graduate assistantships.

Collaborative Opportunities
Three other institutions in North Carolina offer a Ph.D. in Computer Science: UNC Chapel Hill, North Carolina State University, and Duke University. The proposed program exhibits little to no course overlap with these existing programs, the most overlap being with NC State. NC A&T will seek an inter-institutional registration agreement with NC State to enable student access to five courses that are common across their two curricula. Additionally, UNC Charlotte offers a Ph.D. in Information Technology with a computer science concentration. NC A&T has numerous and long-standing collaborations with UNC Charlotte's Department of Software and Information Systems in information assurance and cybersecurity research, instruction, and outreach. NC A&T currently offers a Ph.D. in Computational Science and Engineering, which applies high performance techniques such as computational modeling, simulation, and visualization to engineering disciplines, physical and biological sciences, energy and environment, and business and economic modeling. While the Computational Science and Engineering program has a different focus and target audience for applicants, the program faculty will collaborate closely in research and co-advising of students.

Outcome of Consultation with Disciplinary Experts
In March 2012, the program was presented to the UNC Graduate Council**.** Council members suggested that the program should pay attention to retention, as computer science students at master's and doctoral levels receive job offers that compete with the goal of degree completion. The Council also asked for verification, and the program representatives confirmed, that they plan to recruit nationally and can admit students with either B.S. or M.S. level preparation (students with thesis and non-thesis project-based experiences). The Council advised that a program faculty of their size (12) should be mindful to grow the program at such a rate as to successfully manage new doctoral enrollment and advising loads while also maintaining responsibilities in baccalaureate and master's level programs. The Council voted without dissent to approve the program.

The Request to Establish was reviewed by four independent external reviewers. As a whole, external reviewer comments were favorable and agreed that excellent employment prospects will exist for these graduates in the foreseeable future. Reviewers were impressed with the high level of funded research and publication achieved by existing faculty considering their high teaching loads. Similar to the UNC Graduate Council, external reviewers suggested, and NC A&T agreed, that the projected enrollments and program growth should be at a level that ensures the faculty are able to provide effective mentoring, maintain a viable cohort of doctoral students, and remain well within the degree productivity expectations established by current policy. External reviewers also encouraged NC A&T,

and they agreed, to more closely align select minimum admission requirements with those of computer science Ph.D. programs at their peer institutions.

Recommendation

It is recommended that the Board of Governors approve North Carolina A&T State University's request to establish a Doctor of Philosophy in Computer Science degree program (CIP 11.0701) effective January 2014.