



HARRIS PASTIDES
PRESIDENT

April 30, 2009

Dr. Garrison Walters
Executive Director
South Carolina Commission on Higher Education
1333 Main Street, Suite 200
Columbia, South Carolina 29201

Dear Dr. Walters:

Attached to this letter is a new program planning summary for the Bachelor of Science degree with a major in Computational Science at the University of South Carolina in Beaufort. The suggested CIP code is 11.0701.

The planned program addresses curricular needs in the USC-Beaufort sphere, and is in keeping with the mission and goals of the USC system. I write to request that the summary be submitted for discussion at the next Commission on Higher Education Advisory Committee on Academic Programs meeting.

Sincerely,

A handwritten signature in cursive script that reads "H. Pastides".

Harris Pastides

Attachment

c: Kristia H. Finnigan, Assistant Provost for Academic Programs



**Program Planning Summary
For New Program**

University of South Carolina Beaufort

**Title of Program: Bachelor of Science
Major: Computational Science**

November 2008

H. Pastides

Dr. Harris Pastides, President

4/30/09

Date

Program Planning Summary

University of South Carolina Beaufort (USCB)

Bachelor of Science

Major: Computational Science*

CIP code: 11.0701

* *Computational Science and its Relationship to Computer Science*: Computational science has been defined as "a field of study that integrates computer science, mathematics and natural science" (*An overview of computational science*, J.L. Noyes, 2004, Wittenberg Univ.). Many other definitions exist as well, for example, the Computational Science Education Project (CSEP) (1995, online at <http://www.phy.ornl.gov/csep>) defines Computational Science as a discipline whose intent is to "focus on a scientific or engineering problem and draw from computer science and mathematics to gain an improved understanding of the problem area". More recently, the President's Information Technology Advisory Committee (PITAC) (2005, online at <http://www.nitrd.gov/pitac/reports/>) stated Computational Science is "a multidisciplinary field that uses advanced computing capabilities to understand and solve complex problems. Computational science fuses three distinct elements: (1) Algorithms and modeling & simulation software developed to solve science (e.g., biological; physical, and social), engineering, and humanities problems, (2) Computer and information science that develops and optimizes the advanced system hardware, software, networking, and data management components needed to solve computationally demanding problems, and (3) The computing infrastructure that supports both the science and engineering problem solving and the developmental computer and information science".

There is a need to recognize Computational Science as different from Computer Science. Computational science is "itself a discipline" (PITAC, 2005), but according to the Classification of Instructional Programs (CIP, 2000), Computational Science and Computer Science still share the same CIP code, 11.0701.

Program Designation

This is a *New Program Proposal* for a Bachelor of Science degree in Computational Science at USCB. The degree will require a minimum of 120 credit hours of coursework, which includes approximately 50 hours of general education and 70 hours of coursework in the computational science major and electives.

Designation of Undergraduate Program

Four-year program

Program qualifies for supplemental Palmetto Fellows Scholarship and LIFE Scholarship awards: Yes

Proposed Date of Implementation

Fall 2010

Justification of Need for the Proposed Program

The need for a Computational Science program is driven by a number of illustrative factors; according to the report *Computational Science: Ensuring America's Competitiveness* by the PITAC (2005), "Computational science - the use of advanced computing capabilities to understand and solve complex problems - has become critical to scientific leadership, economic competitiveness, and national security". The PITAC believes that "computational science is one of the most important technical fields of the 21st century because it is essential to advances throughout society". Unfortunately, PITAC also reported that "only a small fraction of the potential of Computational Science is being realized, thereby compromising U.S. preeminence in science and engineering".

The PITAC document (located online at <http://www.nitrd.gov/pitac/reports/>) makes the justification of the necessity of growth in Computational Science abundantly clear to the reader. For those not readily familiar with this specialized field, it is an insightful read. On a regional level, Computational Science is critical to the economic development of the area in the Lowcountry of South Carolina, a region on the southeastern coast of the state which includes the counties of Beaufort, Jasper, Colleton and Hampton. The area includes one census tract defined as micropolitan - Hilton Head Island/Bluffton - but is primarily rural and racially diverse.

The current economy of the region is based heavily on agriculture and the hospitality/tourism industry, both of which rely primarily on low paying jobs. In response to these conditions, the Lowcountry Council of Governments (LCOG) has prepared an Economic Diversification Plan, based on expansion in the Lowcountry of five types of industry: Logistics/Distribution (including a planned expansion of the Port of Savannah into neighboring Jasper County), Health Care/Medical, Construction, Wholesale Trade, and Manufacturing. Each of these industries will require employees skilled in the use of computers and computational technology, from security and logistical analyses of the port, to the CAD design processes used in architecture and manufacturing, to medical database mining and analyses to financial modeling and forecasting. If USCB students fail to have ample opportunity to acquire the skills necessary to compete for computationally intensive positions within these fields, they will be at a considerable disadvantage when competing for high paying jobs even within their own home region.

Anticipated Program Demand and Productivity

Presently, Biology is the only science/technology degree program available to students at USCB. Incoming USCB students who wish to major in other science/technology areas are unable to receive desired education without relocating to other areas of the state. In surveys of students taking computer science classes in 2007-08, approximately 25% of all students indicated that they would enter into an appropriate program if one were available. The largest obstacle is simply that students (and many others) have never heard of Computational Science because of its new perspective in the 21st century world. Reading the PITAC document, it is clear that PITAC believes this is the future of Science itself. Of the students surveyed, 90% of them indicated that they would be finishing their degrees at other institutions in order to obtain an appropriate degree. This high level of interest suggests that a four year Computational Science program is both relevant and practical for those who wish to enter computationally enhanced technological fields. Moreover, USCB will be able to retain those students that desire computationally intensive degrees within the State University system.

In addition to demands from students, USCB has also been recently contacted by a local employer; Carecore National, the country's fastest-growing outpatient diagnostic imaging utilization management services provider, has particularly requested that USCB provide students in Computational Science for possible collaboration and employment in its computing technology and data management services for its southeast center in Bluffton, South Carolina.

USCB anticipates enrolling approximately 15 new students each year, and when the proposed Computational Science program becomes fully operational, we expect at least 60 students will be enrolled by Spring 2015. This expectation may be grossly underestimated if, indeed, the PITAC document accurately portrays the role and needs of Computational Science education in the U.S. post-secondary education system.

Assessment of Extent to Which the Proposed Program Duplicates Existing Programs in the State

Although there are a number of Computer Science programs across the state of South Carolina, no program in Computational Science has yet been implemented in this state (although Wofford College provides an Emphasis in Computational Science within the Computer Science major).

Note that while existing courses in Computer (or Information) Science may be adapted and tailored to a Computational Science program, many new courses (including Cognate courses) must be

developed in order to provide quality to this interdisciplinary field. We expect the undergraduate Computational Science program to be attractive to many potential students in the region, the state, and, indeed, across the country.

Relationship of the Proposed Program to Existing Programs at the Proposing Institution

The Computational Science program will be supported by highly qualified USCB faculty, particularly in Science, Mathematics, and Computer Science. In addition, the USCB Faculty Senate has already voted overwhelmingly in favor of the implementation of a Computational Science program provided adequate funding can be acquired. Department Chairs and the Academic Administration all strongly support the development of this program as well.

While USCB is small (approximately 1193 FTE students in Fall 2008) it is rapidly growing and has increased enrollment over 20% in the last 3 years; this growth trend is expected to continue into the foreseeable future. The newness of USCB together with the rapid increases in enrollment indicates that this is an optimal time to construct a truly interdisciplinary degree in our increasingly complex computational world. It should be noted that the institutional blockades present in many larger, older institutions involving the isolation of disciplines are not apparent here; indeed, the Department of Science and Mathematics at USCB includes mathematics, statistics, computer science, physics, and all other faculty in the physical and biological sciences. Education and research collaborations among faculty from widely differing areas of the sciences routinely occur in this close-knit setting and there is every reason to believe that a foundational program in Computational Science program will serve the needs of a variety of modern degree programs as they emerge at USCB.

Relationship of the Proposed Program to Other Institutions via Inter-Institutional Cooperation

USCB has initiated discussions with the Technical College of the Lowcountry (TCL) to plan for optimal transition of TCL graduates into USCB. Moreover, a committee of secondary and post-secondary mathematics educators in the region is working to align mathematics education so as to foster a transition of well-prepared students into the college setting. Plans for a more broadly-based science alignment are underway as well. In addition to these local initiatives, collaboration with other institutions in the state—particularly USC Columbia, and Clemson—will be a high priority to ensure that the appropriate cooperation is created. Nationally, several institutions (including the National Computational Science Alliance and NASA/AMES Computational Science Division) have demonstrated strong support for Computational Science program development. Consequently, a program at USCB may initiate future cooperation with these institutions.

Total New Costs Associated with Implementing the Proposed Program (General Estimates Only)

There are no anticipated costs to the University; all start-up funds for the development of this program will come from grants. Continuing costs will be generated by tuition revenue as program development proceeds.

Note that the implementation of a Computational Science program will require the addition of approximately two new full-time faculty members specialized in computationally enhanced fields. These hires are anticipated to be made during 2011 and 2012 and the faculty members will be expected to teach both introductory and high-level courses in Computational Science.

USCB has been included in the South Carolina EPSCoR submission to the National Science Foundation and we anticipate receiving benefit from that grant between 2011 and 2015.