SUBJECT: New Degree Program Proposal: M.S. Mathematics

PROPOSED BOARD ACTION
Approve new Master of Science (M.S.) in Mathematics program.

BACKGROUND INFORMATION
FGCU is requesting permission to offer a M.S. in Mathematics as described in the Executive Summary.

Supporting Documentation Included: Executive Summary

Prepared by: Interim Associate Vice President for Curriculum and Instruction
Cathy Duff

Legal Review by: General Counsel Vee Leonard (April 2, 2010)

Submitted by: Provost and Vice President for Academic Affairs Ron Toll
Florida Gulf Coast University

New Degree Program Proposal
Executive Summary
April 2, 2010

Degree: Master of Science (M.S.)
Major: Mathematics
Concentrations: None
College: Arts and Sciences
Department/Division: Chemistry & Mathematics
Anticipated Implementation Date: Fall 2010
Suggested CIP: 27.0101

Program Description

The proposed Master of Science (M.S.) with a major in Mathematics is designed for students seeking vocational opportunities in quantitative disciplines that typically require post-baccalaureate training as well as for students seeking a foundation for subsequent doctoral level work in applied mathematics or allied fields.

Professional opportunities for graduates of the program would include fields relying heavily on statistical competencies, such as actuarial science and financial/economic analysis; fields requiring advanced skills in handling equations, differential or otherwise, such as systems or network analysis; and fields emphasizing a working knowledge of higher-level combinatorial mathematics, which would run the gamut of quantitative disciplines benefiting from general problem-solving expertise. Graduates of the proposed M.S. Mathematics program would be qualified to teach mathematics as instructors at the college level.

While the program is designed without specific tracks or concentrations, it broadly emphasizes applied mathematics, as opposed to pure mathematics. This balanced graduate curriculum will incorporate elements of pure mathematics. The breadth and depth of the coursework will provide exceptional graduates with a background sufficient to confidently pursue doctoral study. Elective components of the curriculum will allow students to pursue their personal interests, vocational or otherwise.

The proposed degree will require 36 hours of coursework and the satisfactory completion of a comprehensive written examination. A thesis-based degree is not planned at this time. The curriculum has been approved by both the college curriculum team and the university-wide Graduate Curriculum Team. The proposed program is consistent with the criteria for new academic program authorization adopted by the Florida Board of Governors on March 29, 2007.
Consistency with the FGCU Mission and Vision

The proposed M.S. Mathematics program will advance the mission of the university by maintaining rigorous intellectual and academic standards, a challenging and relevant curriculum, a learning atmosphere characterized by the celebration of diversity and academic freedom, a commitment to public service and community involvement, and a constant focus on the advancement of knowledge and the pursuit of truth. The proposed program would similarly fulfill the FGCU vision by serving as a model for expanded recognition of a selected graduate program.

Consistency with the State University System (SUS) of Florida Strategic Plan

Establishment of the proposed M.S. Mathematics program is consistent with the goals of the SUS Strategic Plan 2005-2013. Specifically, the proposed program aligns with the SUS strategic goal of fulfilling the critical need for mathematics education at a level which can directly or indirectly enhance the teaching of secondary school mathematics. Additionally, the program would favor a per capita increase in the number of master's and professional degrees awarded in Florida. A third SUS goal that would be directly served by establishing the program is an increase in research funding. The proposed M.S. Mathematics program would give the FGCU Mathematics Department increased visibility and credibility as a player for the purpose of hiring research talent and attracting external financial or in-kind support.

Need and Demand

In a landmark 2007 report, the Business-Higher Education Forum (BHEF) made the following statement:

American students today have limited interest in studying mathematics and science, and academic achievement in these two foundational disciplines is demonstrably low. This bleak reality poses an acute challenge to our ability to keep American society intellectually vibrant and to ensure that our economy is globally competitive. It is a national imperative, therefore, that we improve achievement by all students in mathematics and science and attract more individuals into science, technology, engineering, and mathematics (STEM) careers. Accomplishing these crucial goals will require nothing short of transformational change in our nation's educational system and, in particular, our mathematics and science teaching workforce.

The BHEF is a collaboration of top level business and academic leaders who have been tracking this issue since 1978 and recognize the need to address it soon with sufficient resources. The shortage of STEM teachers in the U.S. is well known and widely discussed in a variety of other public forums concerned with the general issue of the quality of our technological workforce and the chronic shortfall in the
annual supply of quantitatively trained graduates. Indicators of the severity of the problem range from very low unemployment rates among technically trained college graduates, to the political clamor for fewer restrictions on granting visas to foreign nationals holding master's degrees in technical disciplines, to the generosity of loan forgiveness programs operated by state governments to encourage technically trained graduates to enter teaching careers, to the disproportionate upward pressure on salaries of science, engineering, and mathematics graduates in the high-tech workplace.

The Rand Corp. notes that the number of doctoral degrees in the sciences (including mathematics) has leveled off in recent years, and the unmet demand for individuals with such advanced degrees is causing a migration of master's degree holders to positions formerly the exclusive province of PhDs. The STEM issue has even risen to the level where the American Competitiveness Initiative was introduced in 2006 as part of the President's State of the Union address. This initiative calls for quantitatively trained individuals in private industry to dedicate a portion of their time to the STEM education enterprise. Clearly, the government and the economy are confirming a national need for greater numbers of scientifically and mathematically competent graduates at all levels.

At the state level, Florida lags the nation in a key indicator of secondary school teacher quality, namely the fraction of mathematics teachers who have degrees in mathematics. In Florida, one in three does not according to a statistical study by the Council of Chief State School Officers. The SUS strategic plan designates science and mathematics education as an area needing increased degree production. Master's degree graduates in mathematics are strongly positioned to reenter academia or adapt their quantitative skills to an industrial or professional setting. As Florida's economy becomes more high-tech, their skill sets will be in even greater demand.

The Mathematics Department is confident that the proposed M.S. Mathematics program will be a viable and active addition to the university's degree program inventory. This confidence is borne out by the results of surveys administered to upper division mathematics and engineering students, to members of the Mathematics Club, to mathematics colloquium attendees, and by expressions of interest on the part of university employees both currently working as math laboratory (recitation) staff and elsewhere.

Additionally, the Mathematics Department has an incipient track record providing mathematics content courses in support of an existing College of Education master’s program, as well as graduate courses taken by non-degree seeking students who are secondary or community college teachers needing certification hours. Conversations with students in these ad hoc master’s level courses indicate substantial interest in a coherent master’s program in mathematics.

**Enrollment**

Fifteen students (8.44 FTE) are expected to enroll in the M.S. Mathematics program in the first year. As the program becomes established, enrollment is expected to grow steadily to a headcount of 38 (19.13 FTE) in the fifth year. The model for these estimates is both straightforward and conservative. There are
detailed statistics available showing the correlation of growth of the baccalaureate mathematics program with the growth of the general student population since the founding of the university. A certain fraction of our upper division mathematics majors have expressed in writing serious interest in eventually taking the next step to a master’s degree, and we have applied this percentage to the projected number of mathematics majors (BA/BS) to arrive at estimated headcount by year. To this we have added the number of potential master’s students who are external to the mathematics BS/BA program, but who have responded to our general survey with a high level of interest. This category includes FGCU engineering students, FGCU mathematics lab staff, other FGCU staff, community college faculty, and secondary school faculty. The size of the initial cohort is reflective of pent-up demand for a program of this nature. Recruitment efforts in subsequent years will successively replace graduating students and expand the overall headcount realistically.

Resources

All resources needed to implement the proposed program are already in place in the College of Arts and Sciences and no additional funding is necessary. Nine current faculty will cover the course rotation over the first five year of the program. They will trade lower level courses for graduate courses. The lower level courses will be handled by existing and new instructors/adjuncts with very minor impact on overall curriculum delivery. New faculty will continue to be hired in mathematics to meet growth demands of the university. Mathematics graduate students will provide a much needed resource supporting undergraduate mathematics courses, including instruction once the students have 18 graduate credits. Projected costs in Year 1 include reallocation of $57,560 ($56,560 for faculty salaries and benefits and $1,000 for additional library materials). Projected costs in Year 5 include $114,873 for faculty salaries and benefits and $1,000 for additional library materials.