External Review Team Members:

Professor Jerry Griggs, Department of Mathematics, University of South Carolina
Professor Tin-Yau Tam, Department of Mathematics and Statistics, Auburn University
Professor Harrison Zhou, Department of Statistics, Yale University

On April 13-15, 2014, the above three people, after review of the Self-Study Report of the Department of Mathematics and Statistics (hereafter, Department) of Georgia State University (hereafter, GSU or University) and the Strategic Plan 2011-2016/21 (hereafter, SP), visited with administrators, faculty, and students of the Department, respectively.

We first summarize our basic findings and then offer some recommendations.

I. Summary and Findings

STEM (Science, Technology, Engineering, Mathematics) cannot be over-emphasized and Mathematics and Statistics are key players in STEM and workforce development. They equip students with problem solving skill, both on undergraduate level and graduate levels.

Both GSU and the Department have undergone significant changes in recent years. GSU has emerged as a research institution with increased standards for faculty performance as well as student admission and graduation.

The Self-Study Report Committee did a good job on putting material and information together. The report is an extremely detailed document. The Department Chair, Guantao Chen, has broad and strong faculty support. He himself maintains strong scholarly activity, which is very important for a Chair to effectively lead any department. This, along with his hard work and effective communication with the faculty, places him as a good leader in the Department. Consequently the Department is moving toward stronger internal responsibility for its affairs and good collegiality. We observed good citizenship, commitment and dedication among faculty members in the Department and noticed that they are team players. Students provided very positive feedback indicating that faculty
members are extremely helpful to them on instruction. Faculty often go out of their way such as direct reading when the courses are not available.

We are disappointed to learn that the size of tenured and tenured track faculty is too small to meet teaching and advising responsibilities. In addition, the current success of the department is not sustainable.

Core Curriculum

The Department has very strong involvement with the University’s core curriculum, offering 11 core courses of undergraduate student degree requirements. In Fall 2013, the department taught more students than any other department at GSU except for Biology and Communications. The Department should have a good share of resource because of their contributions to GSU.

The Department has done a commendable job in making significant improvement on the DFW rate of the lower level core courses using the MILE (Emporium) model. The success should be recognized and rewarded. The Department has done a good job on maintaining good enrollment in undergraduate and graduate programs, striving hard to increase the extramural funding in research, especially in the area of interdisciplinary areas, and had good success. There is a deep commitment to undergraduate and graduate education within the department. It appears that administrators, faculty, and graduate teaching assistants are dedicated to the educational mission.

Quality of the Math/Stat Curriculum

The Department offers undergraduate degrees (B.S.) in Mathematics with no concentration and with concentrations in actuarial science, managerial science, computer science, statistics, and computer information systems. The 3-year average of undergraduate majors is around 200 and the vast majority is in mathematics and the total number of Actuarial Science is 14; 1 for Computer Information Systems; 5 for Computer Science; 1 for Managerial Sciences. The major course requirements are substantial and all appear appropriate. In collaboration with the Robinson College of Business, the department also offers dual B.S./M.S. programs in actuarial science, mathematical risk management, and computer information systems. The large number of concentrations in bachelor’s and master’s degree programs complicates advising and course scheduling and could stretch the inadequate faculty resources even thinner.

The undergraduate students who we encountered appeared enthusiastic and were pleased with the personal attention they receive from faculty. The support for undergraduate research experiences is good. Some undergraduate students indicated that basic math courses in topology and geometry were not offered because of insufficient faculty size and expertise; thus they were not adequately prepared for graduate study. They complained that a course required for majors, Modern Algebra, is not offered every
semester, which can delay graduation. Currently, the course in complex analysis (needed by many students for grad school) can only be offered once every two or three years.

The department has also been teaching regular honors sections of Math 1070 Honors Elementary Statistics. On the other hand, we were disappointed to learn that the Department does not offer honors sections of Calculus, or of core required major courses in Algebra and in Analysis.

GSU is located in downtown Atlanta and the Department should take advantage of the environment. The Department currently has no internship program and does not track student internships though a good number of students, particularly those in business related concentrations, such as Actuarial Science and Managerial Science, have been successful in finding internships on their own.

At the graduate level, the department offers an M.S. degree with concentrations in bioinformatics, biostatistics, discrete mathematics, scientific computing, statistics, and statistics with an allied field. A Ph.D. in Mathematics and Statistics is offered with concentrations in Biostatistics, Bioinformatics, and Mathematics. All requirements appear reasonable.

Since Spring 2011, the M.S. program has graduated 59 MS students. Placement rate is 92%. The Ph.D. program has graduated 16 Ph.D. students. Placement rate is 100%. It appears to be very healthy. Many have jobs in private companies, research organizations such as CDC, and academic institutes.

A faculty member in the area of Analysis should be hired immediately since the death of an analyst several years ago. This is a core area of Mathematics, the heart of many programs, and a common qualifying exam topic. Yet at GSU we learned it often must be taught by a lecturer. Additional faculty need to be hired to cover basic mathematical courses in topology and geometry as well as modern algebra.

**Quality of Faculty**

The quality of the faculty is very good. They are industrious in teaching and active in research. The research interests of the faculty provide for good interaction and cover a wide range of mathematics and statistics. Research activity has grown substantially in the Department, which directly supports the strategic plan for GSU to become a leading public research university. Faculty scholarly production is healthy. Indeed it is good given the fact that they received very limited resources. Several faculty members are on editorial boards, including the Department Chair. This is a good sign and the Department should continue to strengthen in this area as well as publishing in good quality journals and obtaining extramural funding. In the past some faculty members did not get tenure and left the Department due to the fact that they were hired before or around the time that GSU emerged as a research institute with increased research standards for faculty while the teaching load remained high.
**PhD program status**

According to SP, the University wanted to expand support for doctoral programs with the goal of maintaining approximately 30 percent of the student body enrolled in graduate programs, with a particular emphasis on PhD and professional doctoral students (Goal 2, Initiative 2).

The Department had a PhD program in place not long ago and accepted its first students in 2008. Currently about half the Ph.D. students in the department are in bioinformatics or biostatistics. Though it had a good start, it requires the continual and strong support from the Dean and the University. The severely inadequate resources (including faculty size, physical facility, course offering) are a concern. To move toward and maintain a high quality PhD program as well as high quality MS and BS programs, the department must maintain high quality faculty of appropriate size. The tenured and tenured track faculty (22) is too small to meet all responsibilities. In 2005, the faculty size was about 25 without PhD program. The full time non-tenure-track faculty is too large relative to the tenured and tenure track faculty. It appears that the department needs to have at least three more statisticians (one in interdisciplinary area) and three more mathematicians (for example, in the area of analysis, geometry and topology) and one more applied mathematician. The Department has responded very positively toward the SP’s “cluster faculty hiring” in the multidisciplinary research for the last several years. The Department’s faculty recruitment needs and development in Mathematics and Statistics should also be addressed based on the faculty inputs.

The graduate students produced a very good number of publications and conference presentations. The have won awards, dissertation grants, conference supports.

**Faculty issues**

The teaching load for faculty is too high as a research department. The standard teaching load of a Math & Stat department with PhD program would be 2+2 or 2+1. The department should also consider a differentiated teaching load for tenured faculty depending on their research productivity. Faculty on tenure-track should have lighter teaching load as part of their start-up package.

Faculty salary equity, compression, and inversion are serious problems in the Department. Though the faculty members are very loyal to the Department, morale is obviously greatly affected by the insufficient funding. A breaking point will soon arrive if the upper administration does not have a plan to tackle the problem. Quality faculty retention will then be a problem and the Department cannot afford to lose quality faculty.

We are very much concerned about the overwhelming responsibilities of statistics/biostatistics faculty. There are only three faculty members. But they are responsible for about half of PhD dissertations and over seventy percent of MS Theses.
Graduate student support

Graduate student support is still far below the levels required for sustaining a Ph.D. program, both in number of students supported and in the level of the stipends. There is not sufficient funding for graduate student teaching assistants (GTAs). Consequently, their stipends are low and their teaching workloads are high, when compared to peer institutions. The high teaching load would affect the research activity of the graduate students and hinder excellence of undergraduate teaching. The student fees are high that make the situation worse.

Space available to the Department is minimal and fully utilized. The Department needs more contiguous space for all department members (including students) and activities. Some graduate students were isolated in other buildings and this situation needs to be corrected as soon as possible. There is not a lounge for undergraduate math majors or graduate students. The common area would promote exchange of ideas on teaching and research, and social bonding. GTA Office space is a serious concern. Some GTAs have no office or shared offices, and it would be challenging for them to provide instruction to their students in the offices. The size of the seminar/colloquium room is far from ideal. We hope that the new facility of the Department would address the space problem of the Department.

The support for graduate students for conference travel seems to be adequate and they are happy with the support level.

II. Recommendations

Priority recommendations

• Increase the number of full-time faculty by 10 tenure-track positions in the long run, but urgently need to increase faculty by 7 in the next 3 years, with 3 in statistics (1 in interdisciplinary area), 1 in analysis, 1 in modern algebra, 1 in geometry and topology, and 1 in applied mathematics.
• In order to recruit high quality faculty members, some good start-up packages should be offered to make the recruitment more competitive.
• In order to recruit high quality PhD students, GTA stipends should be increased and their teaching loads should be reduced, and in line with peer institution standards.
• Develop more GTA fellowships or research assistantships via grants.
• The Department needs to work with the upper administration to identify office spaces for GTAs as well as a student lounge and appropriate colloquium/seminar room in the new building.
• An in house IT person is needed. This would provide necessary IT support, and permit proper website maintenance that would ultimately cast a positive image and develop a good networking with the alumni. The websites are important windows for the department to showcase the achievements of its faculty, staff, and students.

• Develop internship or co-op programs and track data. If adjunct faculty members become inevitable, the Department should consider hiring from private industry or companies. The adjunct faculty members would provide good connection for internship or co-op programs.

• The Department is recommended to start a Professional Master Program in Statistics. A senior faculty needs to be hired to lead this initiative.

Additional recommendations

• The Dean is recommended to work with the Department Chair to develop a plan to deal with the issues of salary equity, compression, and inversion.

• High achieving faculty members should be recognized. It is recommended that the Dean’s office develop endowed professorship via donation from private companies and alumni. This would improve the morale of the faculty members and provide incentive for excellence in research and teaching.

• Implement international educational programs such as Undergraduate Signature Experience (SP Goal 1, Initiative 3), study abroad program.

• Develop more honors courses and establish a higher percentage of math majors participating in honors courses, particularly at the 1000 and 2000 level.