

**Florida Atlantic University**  
**Department of Mathematical Sciences**  
**Program Review**  
**February 16-17, 2015**

**Review Team:**

**Joseph Brennan (University of Central Florida)**  
**Alan Dow (University of North Carolina, Charlotte)**  
**Nurgun Erdol (Florida Atlantic University)**

**OVERVIEW**

The team of Prof. Joseph Brennan, Prof. Alan Dow, and Prof. Nurgun Erdol reviewed FAU's Department of Mathematical Sciences on February 16-17, 2015. Prof. Lee Klingler, chair of the Department, provided the reviewers with a self-study and Ms. Lynn Sargent provided a detailed itinerary and exemplary logistical support. Additionally the review team met with:

- Russell Ivy, Interim Dean, Charles E. Schmidt College of Science and Associate Provost for Programs and Assessment
- Michelle Hawkins, Associate Provost for Planning and Budget
- Ingrid Johanson, Senior Associate Dean for Student Affairs, Charles E. Schmidt College of Science
- Charles Roberts, Associate Dean for Graduate Studies, Charles E. Schmidt College of Science
- Evonne Rezler, Assistant Dean for Assessment, Charles E. Schmidt College of Science,
- Ed Pratt, Dean of Undergraduate Studies
- Deborah L. Floyd, Dean of the Graduate College
- Lee Klingler, Professor and Chair of Mathematical Sciences
- Stephen Locke, Professor and Associate Chair of Mathematical Sciences
- Hongwei Long, Professor of Mathematical Sciences
- Yuan Wang, Professor of Mathematical Sciences
- Roger Goldwyn, Research Professor of Mathematical Sciences and Director of the Mathematics Learning Center
- Jorge Viola-Prioli, Research Professor of Mathematical Sciences
- Erik Lundberg, Assistant Professor of Mathematical Sciences
- Koray Karabina, Assistant Professor of Mathematical Sciences
- Ana Escuder, Instructor of Mathematical Sciences
- Brittanney Amento, Assistant Director, Mathematics Learning Center & eTutoring
- Emily Cimillo, Budget Manager, Outreach Coordinator
- Sonia Kimbrough, Mathematics Computer Lab Coordinator
- Many members of the Department faculty in two separate meetings (tenure track and instructors),
- Graduate and undergraduate students in mathematics.

This review will use the university's 2012-2017 Strategic Plan to contextualize the review of the Department of Mathematical Sciences in terms of the goals of that plan:

Goal I: Enrich the educational experience

Goal II: Inspire research, scholarship and creative activity

Goal III: Increase FAU's community engagement

Goal IV: Leverage momentum toward achieving FAU's strategic goals by being good stewards of its human, technological, physical and financial resources

More formally, the review team was asked to deliver the following:

1. A response to the questions at the end of the self-study that the Department requests be addressed.
2. A response to the additional questions the review-team was asked.
3. A brief assessment of the areas addressed in the self-study that it is believed are the most salient for purposes of improvement
4. A list of recommendations in the form of action plans that should be considered to take the program to the next level of standing. NOTE: Recommendations will be embedded into the answers to the questions as well as the assessment section.

## **General Comments and Observations**

*The mission of the Department of Mathematical Sciences at Florida Atlantic University is to foster understanding of the mathematical sciences, including both pure and applied aspects of the discipline.*

*We strive to provide first-rate undergraduate and graduate education in the mathematical sciences to our students and to increase mathematical ability in the community at large.*

*We seek to advance the frontiers of mathematical knowledge by engaging in innovative research and tackling fundamental problems in the mathematical sciences.*

*We work to bridge research, education, and applications of the mathematical sciences to serve the needs of the local community and the larger global society*

The Department of Mathematical Sciences does a remarkable job in realizing the department mission with very limited resources.

The outreach programs that the department has launched make it a leader in the state. It has launched several outreach days to draw the attention of the surrounding community to the department and the potential in the study of mathematics. It has also launched a pair of Mathematics Circles. There is one circle for middle grade students, and one circle for teachers. These laudable efforts have not yet produced an increase in department undergraduate majors. They are however powerful tools that will bear fruit for the community and for the department. This level of community engagement is not seen in

many mathematics departments and the hard work of members of this department is evident.

The conversations that the review team had with various constituencies in the department has clearly shown that the department, as a whole, has a real interest in student learning and curricular development. The department has taken several strong initiatives to improve student learning in lower division undergraduate courses. Establishment of coordinated lower division courses has focused the multiple sections of the courses on a common basis and has improved student success. The Math Learning Center is a tremendous tool to assist students by providing one-on-one contact with a member of the mathematics department to guide the student to self-discovery. It is also an important tool for the department to recruit and retain minors and majors from the undergraduate tutors that are hired to work in the lab.

Another important innovation in lower divisional courses is the Mathematics Computer Lab. Although the department does not indicate that there have been large changes in the DFW rate for courses utilizing this lab, it does report anecdotal evidence of improvement in student success in succeeding coursework. This is very important. The lower division undergraduate courses in mathematics require the accession by students of a great deal of technique. The use of the Mathematics Computer Lab, online homework, and progress monitoring of students makes it possible to guide students to proper level of competency necessary for future success. In addition, the Mathematics Computer Lab is also an important tool for the department to recruit minors and majors from the undergraduate tutors that are hired to work in the lab.

The situation is somewhat different at the upper division undergraduate level. The program does not seem to have developed for a considerable length of time. New leadership of the undergraduate program and the new goal for the undergraduate program that is articulated in the department self-study

*The department will continuously review its undergraduate programs in order to create an environment in which students succeed.*

are important first steps. ***The review panel is making a recommendation to remake the undergraduate mathematics from first principles.*** This is not the easy way to change the program but it is an important step in presenting to students an undergraduate program that is reflective of the demands that the marketplace places on them.

The graduate program of the department is very successful for an institution of the size and history of Florida Atlantic University but is challenged by difficulties in recruitment.

The department is particularly successful in its doctoral program. The history of placements of successful graduate students is very impressive given the size and age of the program and reflects the efforts of the mathematics faculty to effectively advise students. Recognition by the department as part of the ongoing assessment of the program that incoming students were having difficulty in passing the qualifying examination

brought an appropriate response in the form of additional coursework to address the problem.

The masters programs are more difficult to assess. There appears to be no consensus as to the mission of the masters programs and the market for masters' students has been altered by the mission change of the local state colleges. Some of the programs are difficult to complete due to required courses that are not offered every semester or every year. The end of the grant that resulted in the development of the MST program for middle school teachers has greatly affected enrollment in that program.

The department has some internationally recognized researchers who are leaders in their own research area as well as strong mentors and models for the work of junior faculty and graduate students. The range of effort by department faculty is however very wide. Nineteen percent of the tenured faculty members in the department do not report a published paper since 2011 on their vita. Some other tenured faculty, although meeting the criteria of having published since 2011, do not appear to be pursuing fundamental questions or innovative research. In the search for external funding, the visibility of a strong research environment is an essential element both in terms of evidence of the proposer's ability to perform the research and in terms of evidence of the institutional commitment to the proposed project.

In the course of the discussions with faculty in the department, it became apparent to the program team that the critical role of senior faculty and also the rationale on which external funding agencies make funding decisions has been seriously misunderstood by the prior university administration. These prior administrators in their ignorance made very unfortunate comments to faculty. Although it was represented to the team that the current administration understands that different faculty can make contributions in different roles and that excellent research is not a synonym for funded research, steps need to be taken to support and to provide recognition for excellent research by senior faculty members. Naturally senior faculty should continue to appropriately seek external funding. They also play another vital role. These are the faculty who will influence and mentor the junior faculty of the department to aggressively compete for external funding. They are part of the research infrastructure. They are an absolutely critical element in that quest.

Given the limitations under which the department has operated, it has a very good record of engaging in interdisciplinary research with researchers in other departments at Florida Atlantic University and elsewhere. The department needs to help ensure that these efforts are more broadly known both within the university and in the community (perhaps even the department). The department currently has one affiliated faculty member at the Harbor Branch Oceanographic Institute. The distance between the Boca Raton and the Harbor Branch campuses is a deterrence to close collaboration. If it is generally desired to deepen the collaboration between the ocean modeling and biophysical processes group and the department, it should be made a priority to hire mathematicians to work with this group and arrange their workload and schedule to make collaboration possible.

As might be readily expected after an extended period of budget cuts and no salary increases, there is a serious issue with faculty morale in the department. It is crucial for both the department and the college to find means of recognition of excellent faculty performance. Because the environment exists where there is no meaningful distinction provided for continued performance at an outstanding level, there is a corrosive effect on the faculty that will be felt for some time to come.

Given very limited resources and little ability to provide adequate rewards for excellent performance the Department of Mathematical Sciences at Florida Atlantic University has done very well. Good leadership and a vision for the department's future has limited the damage from repeated budget cuts and has allowed the development of a department poised to improve. A strong doctoral program and a program of innovation in lower division undergraduate courses are important strengths of the department. The undergraduate major and minor programs and research activity remain areas in which improvement is desirable.

It is clear that the support that the current FAU administration has been able to give to the department is an important element in the continuing improvement of the department. The future of the department is to be found in the new faculty that the department has been able to hire. It is extremely important that this support that is contributing to the rejuvenation of the department continue. It is the most important item that this review team can emphasize. This support is absolutely critical to the department's ability to accomplish its mission and is essential to the future development of the department. It is also incumbent on the department leadership to leverage this renewal by fostering a department culture that recognizes, encourages, and rewards excellence in research and teaching and an expansive view of the role of the department not only in the university but also in the broader community.

## RECOMMENDATIONS

### Response to Self-Study Questions

In its self-study, the Department asked for general recommendations for program improvement and responses to specific questions. This section addresses those questions and provides general recommendations. Some of these recommendations require additional support from the University and College while others do not necessarily require substantial increases in resources.

Specific questions and responses:

1. *How can we further improve student success in our mathematics classes? How can we stimulate more undergraduate research? What metrics would you recommend to measure success?*

The review team makes no sweeping statement about metrics that the department should use to measure its success across the curriculum. However we do make strong recommendations connected to this as it pertains to lower division courses (see recommendation 3).

On the issues in the other questions the review team offers the following recommendations.

#### **Recommendation 1:** *Determine appropriate placement mechanisms*

The student population of FAU comes from a number of different sources. An accurate evaluation of the student's likelihood of success in a given course is essential both for student success and for prudent stewardship of resources. While a placement exam is in place, data that would indicate the success of the exam was not available. Data was also not available on success of transfers to FAU from the state college system, on the success of students taking prerequisites at FAU, and on the success of students who placed into courses by acceleration methods for undergraduate students. It is necessary to have good data to make informed decisions regarding student placement. The importance of this in addressing issues on student performance cannot be overestimated. The absence of informative data contributes to a general malaise and complacency that there is little that can, or should, be done.

#### **Recommendation 2:** *Inaugurate articulation discussions with the local state colleges*

A sizeable part of the population of FAU mathematics students comes from the state college system. As data is not available to confirm the anecdotal information that there are problems with the articulation of these students, the acquisition of data to confirm or refute this issue should be a high priority. If there are issues, efforts should be made to initiate a discussion on the issues with the state colleges. These discussions should be at least at the dean/chair level because of the sensitivity of the

issues and to ensure that decision makers at all the institutions are directly involved in the discussions.

**Recommendation 3:** *Coordinate lower-division multi-section courses*

Although complete uniformity is neither possible nor desirable, some degree of uniformity in lower-division courses is necessary. Multiple sections of a course require coordination to ensure that the required material is included not only in the syllabus but also in the classroom. Coordinated assessment ensures that the grading of the large numbers of students taking these courses faces the same expectations. Meaningful and coordinated measures of learning outcomes allowing for proper recognition of instructor engagement and performance is crucial to fostering a culture of excellence and effectiveness in these challenging teaching assignments.

Course coordination in pre-calculus courses appears to have had positive effects in student performance in these courses. While there are issues to extending coordination to other courses these issues should be overcome to bring coordination to all multi-section lower division courses.

**Recommendation 4:** *Employ more undergraduate learning assistants and tutors*

The Mathematics Learning Center provides a positive environment for student learning. The tutors who work there provide an important service for the department. Undergraduate Learning Assistants provide peer support to students within critical classes. Each of these programs is meritorious on their own merits, but that both of these programs are a means to recruit mathematics majors is not utilized. Funds should be found to expand these programs so as to achieve both an increase in student learning and to recruit for the department programs.

**Recommendation 5:** *Maintain high expectations of performance in classes*

This recommendation is two-fold. The first aspect of this recommendation is that the courses themselves should demand of students a high level of achievement. The second aspect is that faculty who teach the courses should accept the professional challenge to bring students from the level at which they enter courses to meet the standard expected.

**Recommendation 6:** *Redirect the undergraduate honors program*

The undergraduate honors program has a substantial list of requirements with multiple ways of satisfying these requirements. If undergraduate research is highly valued by the department these requirements should be simplified to majoring in a program in the department, possessing a suitable GPA and writing an honors thesis on an undergraduate research project supervised by a faculty member.

**Recommendation 7:** *Offer required coursework often*

Required courses are choke points in programs. Most required courses for departmental program are offered every semester. When required courses are offered only once a year (such as MAP 4172/MAP 4173 Actuarial Mathematics 1-2), non-success in the course can mean a delay of at least one year in the completion of the program. Some courses required for programs in the department are offered only every other year (e.g. STA 4102 Computational Statistics). If a course is required for a program, it should be offered at a minimum every year and ought to be offered every semester.

**Recommendation 8:** *Increase faculty engagement in teaching*

Although most faculty members in the department were observed as being actively engaged in teaching and striving for excellence in the classroom and elsewhere, it is unmistakable that there are members of the faculty who are not so engaged. It is also clear that there are many reasons for faculty disengagement. There are no easy ways to address this problem. It is however crucial to the development of the department that means be found to increase faculty engagement in improving teaching.

One possible suggestion, if it is not being done already, is that during the annual reviews, individual instructors should be required to make brief personal self-assessments and the department review process should respond with encouragement or constructive criticism as seems appropriate.

2. *How might we recruit more students for our undergraduate and graduate degree programs?*

**Recommendation 9:** *Simplify the mathematics minor.*

The mathematics minor should be seen and used as a recruitment tool. It should be designed so that it will be easily accessible for any physical science or engineering major. The requirements of the minor should be flexible not prescriptive. The current minor requires that a student take one of four reasonably difficult upper-divisional courses. Rather than posing an obstacle to students to become involved with the department and see its benefits, the requirements for the minor should be flexible enough to invite students to the major. Make the minor appear more attractive and let the beauty of mathematics as demonstrated by excellent teachers in lower division courses entice more interest. Follow this up with good advising and easy availability of career options. Think about flexible pathways into the completion of a math major.



**Recommendation 10:** *Expand outreach efforts*

The department has made a laudable effort in its outreach to the community through the Math Circles for teachers and for middle school students, Math Days and competitions. These efforts need to expand to provide math circles for secondary school students, as well as outreach days for women (Sonia Kovalevsky Days) and minorities. It would be useful if these programs could also involve parents to educate them regarding the career possibilities in mathematics.

**Recommendation 11:** *Redesign the department webpage*

The department webpage is dated and revision should be undertaken to improve the visibility and perception of the department. In particular the website should be used to further the department's objectives. There should be sections providing students with current information about happenings in the department and greater and more directed information about potential careers. It should also be used to convey more information to the university community about the faculty's research interests and the department's interdisciplinary research successes.

3. *How might we restructure our undergraduate and graduate degree programs to enhance the career options of our majors? To provide more interdisciplinary opportunities? How might we secure more internship positions for our students?*

**Recommendation 12:** *Undertake a complete de novo redesign of the Undergraduate curriculum.*

The undergraduate curriculum needs to be completely re-designed. Neither the BA nor the BS program meets the goals set forth in their identical description in the self-study of  
“...prepares students for career opportunities in the mathematical sciences. With suitably chosen electives, constitutes an excellent background for a wide range of careers, in particular as a systems analyst, mathematics teacher, actuary and statistician, including those that require further study at the graduate level.”

The curriculum provides no follow-up as to how these limited career options might be achieved, no indication of how one might pursue electives to obtain a career as a systems analyst, the actuarial science certificate makes no mention of the importance of VEE coursework nor includes any course that currently satisfies any of the VEE coursework requirements, and the statistics minor and certificate have no component on using statistics in another discipline.

This redesign should be done without reference to the courses currently offered. The goals of the program objectives and the curricular means to obtain those objectives should be the criterion for the program redesign.

The department should consider the programs at FSU, UCF, USF, UF and the new undergraduate program at FIU as in-state models for a program redesign. Out of state models for program redesign might include New Jersey Institute of Technology, University of Pittsburgh, and Ohio University (see in particular the Meteorology Major).

Redesign of the undergraduate curriculum should follow the outlines of the 2015 CUPM Curriculum Guide to Majors in the Mathematical Sciences with particular regard to the content recommendations (currently 9) for a program in mathematics.

**Recommendation 13:** *Adopt the state mandated Common Program Prerequisites as part of the undergraduate curriculum.*

The program is apparently currently not aligned with the Common Program Prerequisites from the Florida Center for Advising Support (document attached). In particular both the BA and the BS are missing the requirement of a COP scientific programming course for computer science majors (at FAU this would appear to be COP 3014/COP 3014L). The BS program is lacking the flexibility to choose a science course for science majors in Biology (at FSU this would appear to be BSC 1010/BSC 1010L) or in Geosciences (although it is not clear that an appropriate course exists at FAU). The BA program is lacking the requirement to take any science course for majors.

**Recommendation 14:** *Establish an undergraduate major in statistics.*

The current certificate program in statistics has inadequate course offerings. A major in statistics with adequate course offerings will offer opportunity to students to pursue this important area of study. This program should be designed with reference to the 2014 curriculum guidelines for undergraduate programs in statistical science of the American Statistical Association.

**Recommendation 15:** *Establish a master's program in statistics*

The need for qualified statisticians is very high. The Bureau of Labor Statistics characterizes job outlook in 2012-2022 for Statisticians as growing much faster than average with above median salaries. A master's program would allow FAU students access to this market. The department has a number of faculty members who can teach statistics but 3 to 4 additional faculty will be needed to meet the needs required by this and the previous recommendation.

**Recommendation 16:** *Establish an outreach program to regional employers*

The best way to create internship opportunities is to identify regional employers of mathematicians and statisticians. These should be invited to an appropriate outreach activity that would feature the capabilities of department students.

4. *What are effective strategies for increasing research grant funding? For establishing more connections with local industry?*

**Recommendation 17:** *Provide greater recognition for research: funded and unfunded*

The importance of the pursuit of sponsored funding for research is an important and unavoidable element of contemporary academic life. What is sometimes ignored is the importance of the establishment of the proper conditions for the success of funding efforts. It should be clear to all that the criteria for sponsored funding agencies is based on their own criteria, interests, and limitations and is not a statement of the value of the proposer.

**Recommendation 18:** *Provide support for large and involved funding projects*

Many research grants are large and involve the interaction of many faculty members. Often faculty members are not aware of these grants nor do they always understand the role that they can play in large projects. It is incumbent on the research administration to find means to coordinate these projects and to properly identify faculty members who would best serve on these grants. This is particularly important for structural grants that would not necessarily immediately arise from a particular researcher's interests such as the GANN program, the ADVANCE program, the REU program, and the GOALI program.

5. *What are successful models that exist for integrating mathematics into the teaching and research of other areas of the university, cutting across departments and colleges (e.g., joint hires, creation of interdisciplinary centers, etc.)?*

**Recommendation 19:** *Broaden course offerings in mathematics to emphasize applicability of mathematical techniques to provide solutions in other disciplines.*

Undergraduate students should have the opportunity to see the role of Mathematics showcased in a number of fields. While cryptography is one field in which the department has made this apparent to undergraduates the opportunity should be taken to ensure that students have a chance to explore mathematics in different contexts. This is an opportunity to showcase the interdisciplinary character of mathematics and to draw students to mathematics.

## **Additional Questions Addressed to the Review Team**

In addition to the questions in the self-study, the review team was instructed to address the following questions.

1. *What changes might be employed to the method of instruction in Calculus with Analytic Geometry to address high DFW rates for this course.*

The changes suggested in Recommendations 1-4 and Recommendation 8 above can address the problem of high DFW rates in Calculus with Analytic Geometry.

However this question was presented to the program team without sufficient data to completely evaluate the problem.

Regardless of the inability of the review team to completely make an evaluation of the problem, it is clear that improvements to Calculus instruction must be made a department priority. In realizing these improvements attention should be directed to providing a means to nurture and engage the calculus instructional faculty so as to make them part of the effort in improving the instruction (Recommendations 1, 3 and 8). The coordination of the course should include assessment methods that will allow the department to recognize and reward instructor success at improving learning outcomes and provide mechanisms to address issues that arise (Recommendations 3 and 5).

To be absolutely clear about this let us indicate that this is not a call for lowering standards. It is a call to establish a higher level of professionalism in the classroom and a call to seek teaching strategies and methods whether new or old, innovative or routine to address the needs of all the students in the class. The use of innovative teaching strategies that work for and encourage weaker students is not the same as lowering standards. It is rising to the role of being a teacher of students.

2. *What means might be employed to encourage the participation of members of the faculty of the Department of Mathematical Sciences in interdisciplinary research*

This question was addressed to the review team with an underlying assumption that the department faculty members were not engaged in interdisciplinary activity. On investigation by the review team, it quickly became apparent that members of the department were actively engaged in interdisciplinary research at a level corresponding both to the distribution of faculty research interests and proportional to the size of the department. The problem appears to be slightly different from the assumption underlying the question.

The researchers involved in interdisciplinary research are not engaged in the areas of interdisciplinary research that is of high interest to the upper administration of the university. The question is potentially better posed as to find means to encourage members of the Mathematical Sciences faculty to engage in interdisciplinary research

in the signature theme research areas of FAU: Marine and Coastal Issues, Biotechnology and Contemporary Social Changes.

In addition to Recommendation 17 above the following recommendations are made to address this question.

**Recommendation 20:** *Increase the visibility of the Department of Mathematical Sciences*

The Department of Mathematical Sciences needs to provide information about the research accomplishments and interests of its faculty members to the FAU community. This information should feature faculty whose research interests are most likely to be of interest to researchers in the signature theme research areas.

**Recommendation 21:** *Encourage researchers in other disciplines to seek out mathematicians*

Issues of communication and expectation can complicate the commencement of interdisciplinary research. These can delay or frustrate the development of a collaborative effort. Incentives must be created to convince the parties that the investment of time and effort to explain their problems to mathematicians.

**Recommendation 22:** *Remove disincentives for mathematicians to do interdisciplinary work*

Distinctions regarding between being a PI and being a Co-Pi, authorial position, multiply authored papers vs single authored papers and differences in the sociology of mathematics as opposed to the sociology of other disciplines provide disincentives for mathematicians to engage in interdisciplinary work. Establishing policies for faculty evaluation that reward mathematicians is crucial to encourage interdisciplinary work.

### **Brief assessment from the departmental self-study of areas that are identified by the review team as most salient for improvement**

There is but one salient factor and it is a factor that is absolutely crucial for the development of the department. As identified in the departmental self-study, it is the department's faculty who are simultaneously the greatest strength and the largest weakness of the department. The engagement of the department faculty is essential for the achievement of the department's, the college's and the universities' objectives.

Budgetary constraints over the last several years have exacted a severe cost on the departmental faculty. The size of the tenured and tenured track faculty is at 26 too small for size and mission of the university. The demographics indicate that it is too old (the self-study indicates the mean age of the faculty at 54 but the median age of the tenured faculty is going to be higher). The salary data indicate that it is significantly underpaid.

Despite increased enrolments, the size of the tenured and tenure-track faculty (26) is now smaller than it was in 2006/2007 (27). Because of budgetary constraints, no tenure-track assistant professors were hired between 2007/2008 and 2012/2013. Instead to meet increased student demand class sizes were increased and a greater reliance was placed on non tenure-track faculty. Although there is instructional demand that is best answered by non tenure-track faculty, the reliance on instructors and visiting faculty does not address other important goals such as increasing research funding and development of increased interdisciplinary research engagement nor does it enable changes in the undergraduate and graduate programs.

The faculty is also extremely vulnerable to being recruited by other universities. The recent loss of a valued assistant professor to another university that was able to offer a significant salary increase is a warning that with an improvement of the economy other faculty may also leave to find other opportunities. The faculty is the most important investment made by the university. If the objectives of the department, college and university are to be realized, means must be found to raise salaries to keep the best junior and senior faculty at Florida Atlantic University.

**Recommendation 23:** *Increase the size of the tenured and tenure-track faculty in the department to 34-36.*

The review team is alert to the fact that this is the recommendation most likely to be ignored by the college and university administration in their evaluation of this document as it involves a serious commitment of funding to the department. It is however well considered and we ask for its serious consideration. This number was obtained by examining faculty sizes at universities of approximately the same size that have similar missions such as the Department of Mathematical Sciences at George Mason University, the Department of Mathematical Sciences of the Indiana University Purdue University at Indianapolis, the Department of Mathematics and Statistics of the University of North Carolina at Charlotte, and the Department of Mathematics at Wayne State University. These are the departments that are able to meet the objectives that Florida Atlantic University aims to achieve. This is the competition that the department faces.

This is not a recommendation that can be realized immediately, but it should be part of a realistic plan for hiring over the next seven years. Finding resources to enable the department to have proper staffing should be a priority.

## CONCLUSION

Despite severe budgetary constraints over the last seven years, the Department of Mathematical Sciences has taken large steps to revitalize instruction, achieving prominence in research, and raising its profile in the community through outreach activity. That this has been possible in the face of these budgetary constraints is in large part due to the efforts of the faculty and the support that it has received from the current college administration. To continue to improve it needs the continued support of the college administration to find the means to address staffing problems.

The future of the department is in the hiring of new assistant professors. The department must in turn use the new resources available to improve instructional engagement on the part of the faculty and to broaden the research engagement with other units keeping particularly in mind the research focus areas of the university.

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