The Department of Mathematics and Statistics offers the following programs:

- BA, Mathematics
- BA, Mathematics, Preparation for Teaching
- BS, Applied Mathematics, Concentration in Applied and Computational Mathematics
- BS, Applied Mathematics, Concentration in Statistics
- BS, Applied Mathematics, Concentration in Economics and Actuarial Science
- Minor, Mathematics
- Minor, Mathematics, For K-8 Teachers
- MA, Mathematics
- MA, Mathematics, Concentration in Mathematics Education
- MS, Mathematics
- MS, Statistics

The Department of Mathematics and Statistics is the largest department in the University in terms of FTES, with 1361 FTES in Fall 2012. The Mathematics and Statistics Department is largely a service department offering mathematics courses for students majoring in science, engineering, business and economics.

**Strengths**
The Mathematics and Statistics department has taken admirable steps to offer online and flipped classes as well as supplemental workshops. The department is commended for their beginning explorations and continuing evaluation for student success.

The department faculty are well recognized for teaching excellence and scholarship, with numerous publications to their credit.

The Center for Applied Mathematics, Computation, and Statistics (CAMCOS) provides the opportunity for a team of students to work under the supervision of a professor on a problem supplied by a local industry or government agency sponsor. CAMCOS participants receive a valuable internship-like experience which helps them prepare for careers in business, government or industry. The students fortunate enough to work on a CAMCOS project gain valuable experience on a time-limited project that also requires a written report and a public presentation.

Assessment is fairly well-established in the department for all degree programs. The newest program, MS in Statistics, has the least assessment activity due to its short history, but seems poised to begin collecting assessment data. Recommendations are to update program goals and learning outcomes to reflect the recently approved University Learning Goals and assessment best practices, and to continue updating and improving data collection, evaluation, and program updates.
Challenges
While student passage rates are lower than the department would like to see in the online course offerings, it is generally acknowledged that online classes are often more difficult in terms of the need for student self-direction and self-motivation. Continued efforts in improving these types of offerings will hopefully improve future student performance.

The department’s average section size and student to faculty ratios are well-above the college and university averages. While this could indicate efficient department operation, care should be taken not to compromise the quality of instruction, especially given the extent to which the department acts as a service program for other departments and the emphasis the university is placing on STEM related programs. Although the number of instructional FTEF in the department is over 47 in Fall 2012, only 57% of the instructional faculty are from tenured or tenure-track faculty. This represents a decline over time, as enrollment has increased and tenured/tenure-track faculty have decreased.

Relative to other departments, the Mathematics and Statistics Department exhibits very low graduation rates in its graduate program. It is important the department address the issues surrounding these low rates, and improve overall student retention and graduation.

The majority of the FTES in the department comes from service courses to other majors and from general education to the campus. The program review of GE in the department was required according to Senate Policy S09-2, and was missing.

The Mathematics and Statistics Department is in need of updated facilities for student learning. The labs are aging and updated hardware and software would likely improve student success rates. The lecturers require reasonable access to printers and photocopiers.

Next Steps
The final step in the program planning process is a meeting with Interim Provost Feinstein (or his designee), AVP of Undergraduate Studies Jaehne, AVP of Graduate Studies and Research Stacks, AVP of Institutional Effectiveness and Analytics Sujitparapitaya, Dean Parrish, and Department Chair Cayco. The faculty members of the department are also invited to attend. The department should contact staff in the Office of Undergraduate Studies to schedule the final meeting. An Action Plan for the department will be developed and agreed upon during the final meeting. The following topics of discussion are recommended by the Program Planning Committee:

- Complete and submit a program review of GE courses in the department in accordance with Senate Policy S09-2 at the earliest convenience.
- Take next steps to advance assessment of student learning, specifically to update program goals and learning outcomes and to continue to advance and improve assessment methodologies.
- Build upon current efforts to manage enrollment and improve low 3-year graduation rates in graduate programs and come up with a plan to improve it.
- Continue its experimentation, exploration, and improvement of techniques for student success.
- Explore alternative funding sources in addition to internal sources to realize the vision of an updated, 21st century math lab, which would benefit the department and the university as a whole.
- Hire tenure-track faculty based on the trends of increasing student enrollment and decreasing faculty staffing over the past five years.
**Recommendation from the Program Planning Committee**

The Program Planning Committee recommends acceptance of the Program Plan. The Program Plan provided a good examination of current and ongoing issues and an explanation of plans for subsequent reviewers.

**Spring 2014 PPC Members**

Jinny Rhee (Chair), Professor, Mechanical Engineering  
Dennis Jaehne, Acting Deputy Provost and AVP of Undergraduate Studies  
Pamela Stacks, AVP of Graduate Studies & Research and Interim COO Research Foundation  
Sutee Sujitparapitaya, AVP of Institutional Effectiveness and Analytics  
Amy D’Andrade, Associate Professor, Social Work  
Mary Calegari, Professor, Accounting and Finance  
Adrienne Eastwood, Associate Professor, English  
Colleen Haight, Associate Professor, Economics  
Noorein Inamdar, Assistant Professor, School of Management  
Lili Luo, Associate Professor, Information Science  
Anthony Raynsford, Assistant Professor, Art and Art History  
Nadia Sorkhabi, Associate Professor, Child and Adolescent Development  
Wenbin Wei, Associate Professor, Aviation  
Brandon White, Associate Professor, Biological Sciences  
Mary Wilson, Lecturer, History  
Diana Wu, Librarian, University Library

CC:  
Bem Cayco, Chair, Department of Mathematics and Statistics  
Michael Parrish, Dean, College of Science  
Elaine Collins, Associate Dean, College of Science  
Stacy Gleixner, Chair, Curriculum and Research  
Dennis Jaehne, AVP Undergraduate Studies  
Pam Stacks, AVP Graduate Studies and Research  
Sutee Sujitparapitaya, AVP Institutional Effectiveness and Analytics
Appendix: Summary of Program Plan and Recommendations

Program Description
The Department of Mathematics and Statistics offers both undergraduate and graduate programs that prepare our alumni to work in industry and to teach in secondary schools or community colleges. Students majoring in mathematics learn to communicate mathematical ideas effectively and to use basic computational skills, mathematical models and technology to solve practical problems. In addition to a BA in mathematics, the department offers a BS in applied mathematics that trains students for more technical careers and incorporates student research projects at the Center for Applied Mathematics, Computation and Statistics (CAMCOS). The department also offers four master’s degrees: an MS and an MA in mathematics, an MA that concentrates on mathematics education and an MS in Statistics.

The department teaches four lower division GE courses covering Area B4: MATH008, MATH10, MATH12, and MATH18. The GE Program Review of these courses are required at the time of the program plan submission, and should be completed at the earliest convenience in accordance with Senate Policy S09-2.

Summary of Changes and Actions
During the last external review in the Spring of 2009, Sheldon Axler made the following suggestions for improving the math department. In response to those suggestions and the department’s own assessments, they have made many changes:

1) Offer Reduced Workloads for Faculty with Active Research Programs: The department has offered fewer course sections with increased section size to faculty with the aim of reducing workload without adversely impacting department productivity.
2) Technology: Increase the Student Exposure to Mathematical Software, Increase the Number of Smart Classrooms: Maple and MATLAB are now used in major courses, and courses requiring programming have been added. The university is currently installing projectors in the classrooms used by the department.
3) Obtain Private Offices for Full-time Faculty: Unresolved
4) Increase Passing Rates for Precalculus and Calculus: 1-unit workshop has been added and has aided in increasing pass rates.
5) Find a Place for Students to Study and Hang Out Together: DH 280 is designated as the Math Club room, and consequently it is very active and growing quickly.
6) Recruit More Undergraduate Math Majors: Faculty members talk about math careers in lower division courses. Effort has been made on the department website.
7) Require/Offer More Advising for Math Majors: Advising is now mandatory every semester to remove advising hold; summer sessions are mandatory for entering freshmen and transfer students.
8) Find a Better Way to Check Prerequisites More Thoroughly: Students are now required to show instructors proof of prerequisites, but automated systems moving forward would be helpful.
9) Create a Center of Excellence: Three concentrations have been added since the last review, and the Center for Applied Math, Computation, and Statistics was established.

Assessment of Student Learning
The undergraduate degree programs in the Math Department have a set of 6 goals, each of which have multiple measurable learning outcomes. The BA and BS degrees are distinguished from each other by covering a different but overlapping subset of the goals. The goals consider national disciplinary
standards by the Mathematical Association of America, the Society of Actuaries, American Statistical Society, and the Society for Industrial and Applied Mathematics. Although some institutional goals, such as critical thinking and communication skills are addressed in the learning outcomes, the list should be updated to reflect the recently approved University Learning Goals (Senate Policy 13-10) in addition to the disciplinary standards, in accordance with expectations for baccalaureate degrees. The revision of the learning outcomes may necessitate corresponding changes to the assessment methods and schedule.

It is evident from the report and the department's assessment website that much effort has been put into assessment of the undergraduate programs, and that gains in lower division course pass rates due to the introduction of workshops and entrance exams have been well-quantified. The department is commended for this important work. In addition, select assignments throughout the curriculum are used to assess achievement of learning outcomes. This practice should be continued and refined with the updated outcomes, and used to continue program improvement. If helpful, the VALUE rubrics, posted on the Assessment website (http://www.sjsu.edu/ugs/faculty/programs/index.html) could be examined as a starting place for the assessment of any new outcomes authored to address the University Learning Goals.

The MA and MS programs in the department have two to three goals each. The learning outcomes for the MA and MS in mathematics are currently identical; moving forward, the difference between the two degree programs should be articulated. Learning outcomes for each goal are listed either in the report or the department assessment website. The emphasis on literature in the field and professional practice is appropriate for graduate programs, and distinguishes it from the undergraduate program. The use of the master's thesis presentations and a qualifying examination are appropriate areas to collect assessment data. The MS in statistics is a newer program. Although it has goals and learning outcomes listed, it has not undergone a significant amount of additional assessment activity at the time of the report.

Assessment data is also presented for GE courses and the remediation program run by the department.

**Required Data Elements**

The Math program ran 57 classes with 225 sections in Fall 2012. The average headcount per section is 30.9, which is above the college (26.4) and university (25.8) averages. The SFR is 28.6, which is also above to the college (22.6) and university (22.2). The Math department is very large, with 1361.6 FTES and 47.6 FTEF.

UG and graduate enrollment in the major is healthy with 146 undergraduates and 81 graduate students in Fall 2012.

Out of the seven majors offered, the majority of the students are in the Mathematics (81) major, followed by Statistics (50), Mathematics (Teach Prep-Sngl) (44), Applied Math/Econ and Actuarial (31), Applied Math/Applied and Comp (14), Applied Math/Statistics (7). The applied and computational math major did not have any enrollment in Fall 2012.

In Fall 2011, the 1st year retention rate for first-time-freshman was 77.4%, which is lower than the college (88.2) and university (82.9) averages. For UG transfers, it was 81.8%, which is lower than the college (89.1) and university averages (86.3). For First time graduates students, it was 75.9%, which is higher than the college average (65.9) but lower than university average (83.5).

In Fall 2006, the 6-year graduation rate for first-time-freshmen is 35.7%, which is below the college (39.5) and university (46.2) averages. For UG transfers, the 3-year graduation rate in fall 2009 was 50%, which is above the college (35.2) but comparable to the university (52.8). The 3-year graduation rate for
graduate students in fall 2009 is 22.2%, which is far below the college (43.2) and university (70.9) averages. This rate exhibits a large amount of fluctuation and warrants further investigation.

Program Resources
In spring 2012, the Math department had 26 full-time tenured and tenure track faculty, with part time faculty at 41 (in Fall 2011). According to the IEA website, in AY 2011-2012, the department had 22.8, 4.0, and 47.3 instructional FTEF for tenured, probationary, and total faculty, respectively, corresponding to 57% tenured/tenure-track instructional faculty. This is slightly above the college (54%) and university (49.1%) averages in 2011/2012. As a foundational area supporting the entire undergraduate educational offerings, it is important to maintain appropriate faculty ratios. Over the past 5 years the department has seen an increase in students of approximately 10%, yet the faculty have decreased by about the same amount, leading to a SFR above the college and university.

There are two full-time staff persons and two student assistants in the office. The department this size and importance would benefit from additional staff support. It is critical that support staff remain adequate to support the department in light of university goals with respect to the emphasis on STEM.

Space constraints do not seem to vary greatly from those faced by other departments in the university. The committee recognizes that an updated, 21st century math lab would greatly benefit the university as a whole. We recommend that the department explore alternative funding sources in addition to internal sources to realize this vision.

Other Strengths and Weaknesses
The committee commends the department for recent efforts in innovative online education and flipped course formats. The committee encourages the department to continue its experimentation, exploration, and improvement of techniques in this area. We recommend additional staff support for this area in order to optimize student progress and faculty transition to the new technologies. We further recommend the Math department explore and learn from other departments that already extensively utilize these types of technology to share best practices.

Recommendations from the Department
- The Mathematics and Statistics Dept. will continue to work on increasing the passing rates in lower division service courses as well as increasing the retention rate of STEM majors to help San Jose State increase the vital supply of scientists, mathematicians, statisticians, scientists, engineers, and mathematics and science teachers in Silicon Valley and California.
- The department will work on improving the communication skills and technology skills of the graduates, which are important to the success of their future careers.
- The department will continue with their plans to make the applied math portion of the program a center of excellence, which now includes a BS Applied Math degree with 3 concentrations, an MS Statistics program which has been approved as a Professional Science Masters degree. Eventually the department would also like to develop a professional science master’s degree in applied math.

Recommendations from External Evaluator
- Road Map for Graduation - It is recommended that the department work with the dean and provost to examine enrollment numbers to ensure classes are offered in a predictable manner, allowing students to better plan their progress to graduation. In response, the department noted that they have been engaged in the following activities to improve retention and graduation rates:
  1) Offering teaching assistantships or lab positions to potential and current credential students hoping that this would encourage undergraduate students to stay for the credential program;
2) Looking into identifying core classes that would be required of the students, one set of core courses for math and another for applied math.
3) Discussing the elimination of the thesis and requiring an exam instead; and
4) Conducting a survey of the requirements for MS math degrees from other CSU’s.

- Advising System - Continue the current system for student advising.
- Faculty Workload - In view of anticipated increases in Math Ed, it is recommended the Department and the Dean work together to determine optimal staffing.
- Viability and Sustainability - It is recommended the department develop one or more options for a viable and sustainable graduate program.
- Center for Applied Mathematics, Computation, and Statistics - It is recommended that the Department, College, and University support CAMCOS as much as possible with the goal of increasing the number of students who take part.
- STATWAY - This new experimental course offers a path through the remediation and GE math requirement, now in its third year. It is recommended that faculty look closely at the text materials, exams, and homework assignments in order to see what the course is actually doing.
- Workshops - It is recommended the department continue their strong current direction in this area.
- Assessment Tools - It is recommended the department consider adopting the newly developed Calculus Concept Inventory. [http://www.ams.org/notices/201308/rnoti-p1018.pdf]
- Faculty Presence - It is recommended that the faculty come into the office more frequently and regularly to contribute to a lively department atmosphere.
- Accommodations for Lecturers - It is recommended that lecturers receive access to computers and printers in their office, access to a photocopier in the same building, and sufficient space to meet with students.

**Recommendations from Dean**
No additional recommendations from the Dean.

**Recommendations from the Program Planning Committee**
- Examine reasons for low 3-year graduation rates in graduate program and come up with a plan to improve it.
- Next steps should be taken to advance assessment of student learning. The learning outcomes for all degree programs should be updated in light of the new University Learning Goals and current assessment practices, along with corresponding updates and improvements to assessment schedules and methodologies.
- The committee encourages the department to continue its experimentation, exploration, and improvement of techniques in online education and flipped class offerings.
- The committee recognizes that an updated, 21st century math lab would greatly benefit the university as a whole, and recommends that the department explore alternative funding sources in addition to internal sources to realize this vision.
- The committee recommends hiring tenure-track faculty based on the trends of increasing student enrollment and decreasing faculty staffing over the past five years.