PROGRAM PLANNING REPORT
SAN JOSE STATE UNIVERSITY

COMPUTER SCIENCE
BACHELOR AND MASTER OF SCIENCE IN COMPUTER SCIENCE
WWW.SJSU.EDU/CS

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BSCS external reviewer: ABET

Date of Report:
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October 31, 2013

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Submissions: Reports are to be submitted electronically via email. Please email the program plan, request for external reviewer (if applicable), and external reviewer’s report to programplanning@sjsu.edu. In addition, please cc the above email on all communications with the dean, external reviewer, Program Planning Committee, and UGS on matters pertaining to your program plan.
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   b. Curricular Content of Degrees, Minors, and Certificates  
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PROGRAM DESCRIPTION

The Computer Science Department has two degree programs: the BS in Computer Science (BSCS) program and the MS in Computer Science (MSCS) program. In addition, the department offers a minor in Computer Science and shares the BS in Software Engineering (BSSE) program with the Computer Engineering Department, which will be covered in their program plan.

The Bachelor of Science in Computer Science (BSCS) degree was first offered by the Mathematics and Computer Science Department in the 1986-87 academic year; prior to that it had been a concentration for the BS in Mathematics degree, and prior to that a minor. The Department of Mathematics and Computer Science split into two departments in 2001. The BSCS program is accredited by ABET (Accreditation Board for Engineering and Technology, abet.org).

The Bachelor of Science in Software Engineering was first offered in 2006.

The Master of Science in Computer Science was first offered in 1978.

The department office is located in 209 MacQuarrie Hall. The department's web site is located at:

http://www.sjsu.edu/cs

1a. Program mission and goals

Mission statement for BSCS program:

*To enable the graduates of the program to function as software engineers or to further their education in graduate school.*

Mission statement for MSCS program:

*To build upon the students' undergraduate foundations in computer science and to advance their knowledge in the field*

1b. Curricular Content of Degrees, Minors, Certificates, and Credentials

The curriculum of the CS minor is described here:

http://www.sjsu.edu/cs/programs/minor_computer_science/index.html

The curriculum of the BSCS program is described here:

http://www.sjsu.edu/cs/programs/bs_computer_science/grad_requirements/index.html

The curriculum of the MSCS program is described here:

http://www.sjsu.edu/cs/programs/mscs/program-info/

1c. Service Courses

*Computer Science - Program Planning Report – Fall 2013*
1. SUMMARY OF PROGRESS, CHANGES, AND PROPOSED ACTIONS

2a. Progress on action plan of previous program review

The 2006-2007 Program Plan listed 19 recommendations:

Recommendations Regarding Curriculum
1. Continue existing undergraduate assessment with an eye to simplifying and streamlining
2. Institute a similar assessment process for the MSCS. Resolve disparities between requirements, goals, and outcomes
3. Complete development of CS 200W
4. Begin automatic prerequisite checks for selected upper division courses
5. Evaluate the role of software engineering in the MSCS program
6. Explore ways to offer joint upper division and graduate classes
7. Proceed with development of a database certificate with IBM
8. Synchronize the BSCS program with new ABET criteria

All eight recommendations were implemented.

Recommendations Regarding Students
1. Develop a comprehensive plan for recruiting and retaining students including minorities and women
2. Further develop the summer exchange program with the Swiss university
3. Examine ways to improve support for student involvement in programming competitions
4. Examine ways to enhance the student experience through CS Club talks, and colloquia

The first two recommendations were implemented. Implementation of the third and fourth have recommendations has had limited success. While the department did produce a nationally ranked competitive programming team and several highly ranked top coders, the faculty member coaching the team retired. We are currently engaging with alumni to help rebuild the team. A recent series of talks by historical figures in Computer Science was sparsely attended by CS majors. The department hopes that its mentoring program will improve student involvement in extracurricular activities.

Recommendations Regarding Faculty
1. Find a reliable source for travel and professional development
2. Encourage the faculty to obtain external grants
3. Begin process for new hires in 2009-10

Recommendation three was implemented, resulting in several new hires. The other two recommendations were not successfully implemented. The department hopes the Technology Partnership program will provide some funds for travel.
Recommendations Regarding Resources

1. Find ways of replacing equipment
2. Explore ways to better use existing space
3. Explore ways to support student graders
4. Explore ways to increase student assistants

While the department does not have a reliable source of funds for replacing equipment, it has managed to replace every faculty member’s computer once every three years. Grants and other onetime sources have been used to pay for other equipment. All of the department’s classrooms have been updated. The department recently re-acquired MH206, which it will use as a study hall.

The department has not found reliable funds for paying graders and student assistants. It is hoped that funds from the Technology Partnership Program can be used for this purpose.

2b. Significant changes to the program and context, if any
Since the last review the department dropped from 18 to 14 faculty members.

2. ASSESSMENT OF STUDENT LEARNING
The BSCS program is accredited by ABET. In fact, the department successfully completed an ABET review on October 22 of this year. All of the required data and reports can be found at our BSCS assessment web site:

http://www.sjsu.edu/cs/assessment/bscs/

3a. Program Learning Objectives (PLO)
PLOs for BSCS program:

http://www.sjsu.edu/cs/assessment/bscs/outcomes/

PLOs for MSCS program:

http://www.cs.sjsu.edu/assessment/mscs/outcomes.htm

3b. Map of PLOs to University Learning Goals (ULG)
Map of BSCS PLOs to ULGs:

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<th>Specialized Knowledge</th>
<th>Broad Integrative Knowledge</th>
<th>Intellectual Skills</th>
<th>Applied Knowledge</th>
<th>Social and Global Responsibilities</th>
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3c. Matrix of PLOs to Courses
The course/PLOs matrix for the BSCS program is here:

http://www.sjsu.edu/cs/assessment/bscs/outcomes/CourseMatrix.html

There is no corresponding matrix for the MSCS program.

3d. Assessment Data
Assessment data since previous ABET review for the BSCS program can be found here:


Assessment data for the MSCS program can be found here:

https://www.cs.sjsu.edu/assessment/mscs/reports/surveys.xls

3e. Assessment Results and Interpretation
Assessment reports for the BSCVS program can be found here:


In addition, summaries of these reports can be found in Appendix B (OARs)
Assessment reports for the MSCS program can be found here:

http://www.cs.sjsu.edu/assessment/mscs/reports/

3f. Placement of Grads
Results of alumni surveys can be found here:


3. PROGRAM METRICS AND REQUIRED DATA
The Required Data Elements discussed in this section are attached in Appendix A of this report.

4a. Enrollment, retention, graduation rates, and graduates
Undergraduate enrollment has steadily increased since the dip experienced after the industry-wide recession of 2000. We expect this trend to continue:
Graduate enrollment has been kept artificially steady due to the limited number of thesis advisors. The department is being asked to dramatically increase these numbers over the next two years. In 2000 the department hired Rocio Avila as a full time advisor. Since that time she has introduced a number of innovative programs to improve retention and graduation rates. Of course improvements in teaching technology (e.g., flipped style lectures) have also helped. The department's retention rates now exceed the university's:

![Retention Rates](image1)

Graduation rates have also improved dramatically:

![Graduation Rates](image2)

Our graduation rates for transfer students would be better except for a few factors:

1. Transfer students often work and so take longer than three years to graduate.
2. Transfer students devote their first two years to GE courses and must start the major with the freshmen level courses.
3. Taking too many CS courses in a semester is inadvisable.
Our total graduation rate for first-time freshmen lags behind the university target of 51.6%, but is steadily rising due to advising intervention efforts.

The department anticipates retention and graduation rates will drop dramatically due to centralization of advising.

4b. Headcount in sections

The following chart compares head count per section for lecture courses:

The CS department doesn't teach large serviceor GE courses like the other departments in the college. Note, however, the sharp increase beginning in Fall 2012. This is largely due to the decision to turn our introductory sequence (CS46A/B) into a large lecture course. Instead of multiple sections of these courses being taught by professors with differing ideas of what to teach, we have single large sections of each course (being taught by lecturers) and multiple lab sections being taught by ISAs.

4c. FTES, Induced Load Matrix

FTES is increasing:
4d. FTEF, SFR, Percentage T/TT Faculty

The following chart compares CS SFR with University SFR over the Fall 2010, 2011, and 2012 semesters:

Note the huge improvement in Fall 2012 lower division SFR compared to the university's. This is due to the consolidation of CS46A/B as single large lectures. Other categories are comparable.

T/TT instructional faculty percentage = \( \frac{14}{24} = 58\% \)

4. PROGRAM RESOURCES

5a. Faculty

The department currently has 14 tenure/tenure track faculty members:

- Tom Austin, assistant professor specializing in security
Robert Chun: professor specializing in computer architecture
Cay Horstmann, professor specializing in software engineering
Sami Khuri, professor specializing in bio-informatics
Suneuy Kim, associate professor specializing in database and software design
T.Y. Lin, professor specializing in data mining
Melody Moh, professor specializing in networks
Teng Moh, associate professor specializing in distributed computing
Jon Pearce, professor specializing in software engineering
Chris Pollett, professor specializing in formal languages
Mark Stamp, professor specializing in security
David Taylor, associate professor specializing in algorithms
Thanh Duc Tran, assistant professor specializing in data science
Chris Tseng, professor specializing in software engineering

This list includes the department chair, who has no teaching duties. It also includes T.Y. Lin, who is on the brink of full retirement. It does not include Michael Beeson, who is completing a FERP in mathematics, Jeff Smith, who is on FERP, and Soon Tee Teoh, who is on professional leave to work at Google and is not expected to return.

The department has a number of short-term and long-term lecturers. Below is a list of our long-trm lecturers:

Adele Atta, lecturer specializing in formal languages
Frank Butt, lecturer specializing in databases
Debra Caires, lecturer specializing in technical writing
Thomas Howell, lecturer specializing in quantum computing
Ron Mak, lecturer specializing in compiler design
Katerina Potika, lecturer specializing in data structures
Kathleen O’Brien, lecturer specializing in programming

5b. Support staff
Until recently, the department enjoyed the services of two technicians and two advisors. These staff members now work for the entire college. The department has a single administrator—DeAnna Diaz. She has two student assistants.

5c. Facilities
The department has four classrooms: MH225, MH422, DH450, and SCI311. Currently, we have two tenure/tenure track faculty members in each office. All lecturers share a single office. It’s necessary for office mates to schedule appointments and office hours at non-overlapping times, which is difficult and in some instances impossible. Sharing offices also discourages faculty from setting up special equipment in their offices.

5. OTHER STRENGTHS, WEAKNESSES, OPPORTUNITIES, AND CHALLENGES
Some recent initiatives of the CS Department:
• Technology Partnership Program
This program solicits donations from local companies in exchange for targeted recruitment opportunities. To date the program has raised approximately $40,000. The details can be found here:

http://www.cs.sjsu.edu/tp/overview.htm

- Peer Mentors Program
To increase retention the department hired and trained student mentors. Each new student is assigned to a mentor. The mentor helps integrate the new student into the department culture. The mentoring program also includes free tutoring, which is provided in a dedicated study hall. When students suddenly stop turning in assignments, instructors can ask mentors to intervene. The program has increased retention in our introductory courses.

- Teaching Improvements/Experiments
The department developed a MOOC version of its introductory CS46A course with Udacity. Two other instructors are delivering courses using EdX. Many faculty members are experimenting with flipped classrooms. The department recently consolidated all CS46A/46B sections into large lectures to deal with varying quality across multiple sections. A course coordinator receives assigned time to manage TAs and instructors.

- Big Data Initiative
The department learned of the demand for data scientists through a member of its industrial advisory board, who introduced the department chair to the CEO of Splunk, a big data company. Splunk helped the department develop and teach a big data course. Splunk also met with the SJSU president and helped convince him of the need for a big data cluster hire.

- Learning and Games Initiative
The big data initiative is one example of the department reaching out to other disciplines to create interdisciplinary programs. The other example is the Learning and Games Consortium. This began as a partnership with the Art Department to develop a center for game studies. Since then Journalism has joined the consortium. The consortium has a partnership with Stanford Research Institute. John Murray, of SRI, serves as the consortium's advisor.

- Promoting competitive programming
At one time the CS department fielded a national championship competitive programming team. After the coach of the team retired, so did interest among the students. The department is trying to revive interest by hosting hack-a-thons and hack-a-thon coaching sessions. Notable recent hack-a-thons were sponsored by Barracuda Networks, and Neurosky.

- Summer University Program
Since 2007 the department has participated in the Summer University Program with The School of Business and Engineering in Yverdon, Switzerland. Every summer ten SJSU students get to travel to Switzerland for a month of short courses and cultural activities. The program provides an opportunity for SJSU students to gain experience with international collaboration. The department hosted the program in 2009 and 2013.

Weaknesses and challenges are discussed in the minutes of the strategic planning retreats, which can be found in Appendix C. Some notable concerns include:

- Unproductive competition with the Computer Engineering Department
- Unproductive ABET assessment activities
- Lack of recognition on and off campus
• Inefficient mechanisms for rapidly updating curriculum
• Lack of a vibrant department culture.
• Ability to meet projected FTES growth
• Centralization of advising and technicians

The department has taken several actions to combat some of these problems and hopes to see results and hopes to see improvements in the near future.

6. DEPARTMENT ACTION PLAN
The department holds monthly strategic planning retreats. The goal is to identify and prioritize problems using assessment data and faculty input, identify strategies for solving these problems, implementing the strategies. The agendas and minutes of these meetings are included in Appendix C.

7. APPENDICES
A. Required Data Elements
   RDE
B. Accreditation Report
   BSCS Outcome assessment reports since last ABET visit
      Spring 2012
      Fall 2012
      Spring 2013
   Result of last ABET visit
      ABET Program Audit Form
   Original self study
      2011 Self Study
   Updated self study
      2012 Response to ABET
C. Strategic Planning Retreats