

EXECUTIVE SUMMARY
Academic Program Review
Computer Science

EXTERNAL REVIEWERS

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CAMPUS VISIT:

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The review team read the self-study written by the faculty in the department; reviewed the curriculum, course syllabi and evaluations; conducted class visits; interviewed faculty, students and staff; and met with the Dean, Associate Deans and other relevant members of the campus community. Prior to their visit, the reviewers were provided with USF's Vision, Mission, Values Statement, the department's self-study and other university materials.

- 1. How did the external review committee rate the quality of the program – excellent, very good, good, adequate, or poor? How does the program compare with benchmark top-tier programs nationally? Please provide a brief rationale for the external review committee's rating.**
 - The reviewers gave the department two ratings – GOOD and VERY GOOD.
 - They rated the program GOOD largely because of their concerns with the undergraduate program's diversity of subject matter and its ability to attract majors.
 - However, the program was extremely strong in terms of software development and if this "narrow focus was taken to be the teaching mission of the department" then it would be rated VERY GOOD.

- 2. What are the most important general issues that emerged from the external review process?**
 - The review team was struck by the collegiality of the department, the fact that they were "engaged and caring teachers", the quality of their research and the amount of service they provide.
 - The reviewers focused most of their attention on the curricular structure of the undergraduate and graduate programs in Computer Science. At the undergraduate level, they were concerned that the heavy course requirements, lack of curriculum breath and low enrollments in the major. At the graduate level, the reviewers expressed some concern about graduate course options, research involvement, advising and the master's project.

- 3. What specific recommendations for improving the program's quality has the external review committee made to the Dean?**

a) Undergraduate Program

i) Major requirements

- The reviewers noted that the curriculum is “geared toward producing well-trained software developers” and the course requirements guarantee that graduating students will have “significant programming and system-building experience and will be well-prepared for jobs in the software industry as well as for CS graduate school.”
- However, while many faculty consider the program rigorous, the reviewers were concerned that it had become inflexible since it left little room for students to explore “other intellectual, experiential and service interests”.
- This was at odds with the University and College mission of providing a liberal education and the review team believed that it was possible to make the curriculum more flexible without sacrificing rigor.
- Currently the CS major requires 70 units (50 units CS, 12 Mathematics and 8 Physics). This leaves little room for electives, gives students no flexibility to double major or minor in another department, makes it impossible for CS majors to go abroad and forces students to begin the major in their first or second semester of the freshman year. It is thus very difficult to attract or draw in students to major who become interested after doing a CS course.
- This structure is more typical of an engineering university than a liberal arts college and reviewers recommended that the department discuss what to retain and where flexibility in the structure of the major might be introduced.

Recommendations

- *The Math requirement be reduced from three courses to two.*
- *The Physics requirement be reduced and/or modified.*
- *The number of CS courses be reduced from ten to eight (the department should consider making CS210 (Assembly/Systems) and CS 220 (Introduction to Parallel Computing) electives not requirements.*
- This would reduce the number of courses required for CS major from fifteen to eleven. It would introduce more flexibility, allow students to start a CS major later, open more paths through the CS curriculum and allow more options for taking classes outside CS.
- The reviewers did not believe this would “water down” the major but it would be more appealing to students who were not pursuing careers as software developers (though this might remain as a track in the CS major).
- The reviewers did not think the department should offer separate B.A. in CS.

ii) Curriculum Breath and Interdisciplinary Requirements

- The reviewers felt that the CS curriculum had a “relatively narrow focus on programming and systems”. While this might be appropriate for software developers, it “provided a limited view of Computer Science as a field” and it might not be attractive to students interested in other areas of the discipline such as “theory, artificial intelligence, assistive technologies, bioinformatics, data mining, electronic commerce, human-computer interaction, machine learning, modeling and simulation, multimedia, robotics or web search”.
- In addition, Computer Science is “growing interdisciplinary” with emerging ties to Art/Media Studies (graphics, multimedia), Biology (bioinformatics, computational biology), Business/Economics (Electronic Commerce), Chemistry (computational

chemistry), Neuroscience/Philosophy/Psychology (artificial intelligence) and Physics (robotics). Yet the department had made little movement in this direction.

Recommendations

- *The reviewers recommended that the department “aggressively explore” the opportunities to draw students from other departments into CS courses and to collaborate with faculty from other departments on team-taught courses and research projects.*
- *In reaching for an interdisciplinary audience, the department needed to avoid setting up long prerequisite chains and it also needed “find staffing and space in the curriculum for such new courses”.*

iii) Enrollments

- The review team noted that the department has “a serious undergraduate enrollment problem”. While low enrollments were a national trend, the problem at USF was particularly acute.
- Enrollments in introductory courses was low and major attrition was high – the department had only graduated four majors per year over the last three years which was “unusually small” for a department of its size.
- Several factors account for this including heavy major requirements, a systems heavy curriculum, long prerequisite chains, and a junior year “wall” (where juniors hit significantly more difficult courses than they had in their sophomore year).
- There are also a low number of women majoring in CS (which is a national phenomenon).

Recommendations

- *Previous recommendations on major requirements, curriculum breadth and interdisciplinarity will help to increase enrollments.*
- *In addition, the review team felt there should be more non-major courses to draw students into CS and breath life into the undergraduate program.*

b) Graduate Program

i) General Observations

- The review team was charged only with reviewing the Master of Science in Computer Science (MSCS). The masters program in Internet Engineering (MSIE) will be reviewed in the next cycle. Nonetheless, the reviewers did suggest that the program name of MSIE be changed.
- Enrollments in MSCS have experienced strong growth but the graduate programs should not divert time and energy from the undergraduate programs.
- The reviewers noted that the graduate students were generally pleased with the quality of the program but there were “mixed opinions regarding the more hardware-courses” that tended to lack standardization.
- The reviewers were concerned with the “current sparseness of course offerings” and they would like to see existing courses offered more often. There is some difference between the variety of courses in the course catalog and what classes are actually offered.
- They also suggested that it would be possible to offer a set of “mixed level courses” that would be appropriate for advanced undergraduates and beginning graduate

students. While care needs to be taken to address the needs of both contingencies of students, this would bring greater flexibility for graduate students from a variety of backgrounds.

- The reviewers were also concerned about the involvement of graduate students in faculty research and the MS thesis option was underutilized.
- Having one faculty advisor for the whole MS program is “simply insufficient” since program growth and the diversity of student interests means that one person cannot reasonably give graduate students the guidance they need.
- Given the time constraints, graduate students need to find out about potential masters projects before the start of class, allowing project selection and team formation to take place early rather than three weeks into the semester. There is also some disparity in the quality of the master’s projects.

Recommendations

- *The review team strongly recommended that resources should not be diverted from undergraduate to graduate programs.*
- *They also recommended that “serious consideration” be given to standardizing the content of hardware courses between different course offerings and broadening the scope of course coverage.*
- *The reviewers recommended that the department give real consideration to offering mixed level courses for advanced undergraduate and beginning graduate students. While care needs to be taken to address the needs of both groups (through different assignments, separate grading curves, and separate class lists, this dual structure can bring greater flexibility. There should be a “structured review of courses to specifically determine good candidates for such mixed population courses”.*
- *The review team recommended “a review of the thesis option in the MS program to determine how it may be transformed into a viable option for students”.*
- *The reviewers felt that while there should be one graduate program director, there should be an early and “broad matching of graduate students with advisers from across the department”. A decentralized advising model gives students more access to faculty guidance and an opportunity to explore meaningful research collaborations with faculty.*
- *The reviewers recommended that students find out about master’s project before class begins, that faculty be more involved in “providing guidance, setting expectations and promoting high quality”. In addition, by publicizing that choosing the MS thesis option precludes the master’s project course, the department might encourage the research option among graduate students.*

c) Faculty, Administration, Facilities and Staff

i) General Observations

- The review team was impressed with the way the department works as whole and by the fact that everyone felt they were on the same team.
- The reviewers noted the positive relationship that existed between the Dean’s Office and the department and, given this was a time of curricular and programmatic revitalization, this administrative support would be crucial in reaching successful outcomes.
- The reviewers emphasized the importance of both undergraduate and graduate merit scholarships as well as additional support for graduate scholarships.

- The review team felt it would be healthy “to provide more clear guidance” for all faculty regarding the promotion and tenure process.
- The reviewers noted that Computer Science facilities are quite distinct from the University’s main Information Technology systems and that their needs are quite specialized and distinct,

Recommendations

- *The reviewers recommended that the department be given an additional faculty member “commensurate with a meaningful department initiative to restructure the curriculum”. This hire should be in an interdisciplinary area or a sub-discipline of CS not currently represented in the department.*
- *The review team recommended that the department form a curriculum committee specifically charged with curricular reinvigoration (at the undergraduate and graduate levels). The reviewers noted that there was “tremendous potential for very significant positive change”.*
- *They also recommended reinstating the 75% reduction in tuition policy for undergraduate merit scholars and looking at additional support for graduate scholarships.*
- *The review team recommended that the University create a new Systems Support position in the Department of Computer Science since the job of the current staff is untenable given the size of various facilities, the number of special projects and the number of individual faculty to support.*

4. In the opinion of the external review committee is the program following the University’s strategic initiative in that it is;

Recruiting and retaining a diverse faculty of outstanding teachers and scholars.

- The review team noted the collegiality of the faculty and praised the way the department works as a whole.
- Decision making was “done by consensus” and faculty felt that everyone in the department was “on the same team”.

Enrolling, supporting and graduating a diverse student body that demonstrates high academic achievement, strong leadership capabilities, a concern for others, and a sense of responsibility for the weak and vulnerable.

- Both undergraduate and graduate students praised the department.
- Students expressed great appreciation for “the faculty member’s sense of humor, approachability, and concern for helping them understand the course material”.

Providing the environment necessary to promote student learning in the program.

- The reviewers noted that the majority of the faculty were engaged and caring teachers who spoke “enthusiastically about their students and courses”.
- The reviewers were impressed by the CS students they met noting that they “seemed bright and mature and spoke confidently and knowledgably about a wide range of CS topics”.

5. In what way is the program contributing to the goal of making the University of San Francisco a premier Jesuit, Catholic urban university with a global perspective that educates leaders who will fashion a more humane and just world?

- The reviewers were very impressed by the service programs in the department that were aimed at “using Computer Science to improve the world”. They were particularly impressed with the annual trip to Peru, something that was very much in line with the mission of the University.

6. What is the timetable for the response to the external review committee’s recommendations for program improvement? What can the AVP’s office do to appropriately respond to the review?

- Provide resources to enable the program to hire an additional faculty member and a staff support person.
- Support and help facilitate the department’s effort to make curricular and programmatic change.
- Continue efforts to improve undergraduate merit scholarships and graduate scholarships.
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7. What general comments or issues, if any, are crucial to understanding the reviewers report?

- The main concern of the review team was with the curricular and programmatic structure of the undergraduate and graduate programs. Almost two-thirds of the entire report is devoted to this issue.