March 10, 2016

PROFESSOR RAJESH GUPTA, Chair
Department of Computer Science and Engineering

SUBJECT: Undergraduate Program Review for the Department of Computer Science and Engineering

Dear Professor Gupta,

The Undergraduate Council discussed the Department of Computer Science and Engineering's 2011 Undergraduate Program Review. The Council supports the findings and recommendations of the review subcommittee and appreciates the thoughtful and proactive response from the Department. The Council's comments centered on the following:

- **Underrepresented Minorities (URMs)** – The Department's implementation of the Summer Program for Incoming Students (SPIS) offers a gateway to preparedness for first-year Computer Science and Engineering (CSE) students. The Department mentions that the program is geared towards those with less preparation in CSE, and while SPIS is not specifically a program for URMs, those who come in with less preparation tend to be URMs. The Dean of the Jacobs School of Engineering touted the success of the program, noting that all the students who participated in SPIS have been retained.

- **Public Speaking** – The Council is pleased to learn of the Dean's plans to create a course on technical public speaking, slated to be offered in Fall 2016. This course will strengthen and standardize leadership and communication skills for students in CSE.

- **Staffing –** The Department's response to the subcommittee's report noted that steps were being taken to alleviate the high workload in the Student Affairs office, but that without the aid of the Virtual Advising Center (VAC), they would not know where they would be. The Council is concerned that the staff remains understaffed while enrollments trend upward, and encourages the Department to continue to explore ways to lighten the staff workload.

The Council will review the Department of Computer Science and Engineering again in the 2017-2018 academic year. The Council extends its thanks to the Department for its engagement in this process and we look forward to the continued discussion

Sincerely,

Geoffrey, Chair
Undergraduate Council

cc: R. Continetti
       T. Javidi
       A. Pisano
       R. Rodriguez
       K. Roy
       B. Sawrey
       M. Sidney

UNDERGRADUATE PROGRAM REVIEW
Department of Computer Science and Engineering

A. Strengths and Weaknesses of the current operation of the department

The Department of Computer Science & Engineering operates effectively and smoothly. The Chair, Rajesh Gupta, is new and brings vision and energy to the department. Especially admirable are his forward-thinking plans for undergraduate education, including his efforts to raise funds for this endeavour through CSE alumni and corporations. The Chair also expressed a desire to give undergraduates more hands-on training, and to rethink the location of undergraduate lab spaces. Specifically, he indicated his desire to integrate undergraduates into the upper floors of the building in order to increase their visibility, access, and collaboration with graduate students and faculty. It is not readily apparent how this will be achieved, but we hope such efforts succeed. We also hope that the emphasis on undergraduate education in not specific to the current chair and continues with future chairs. The Chair is assisted by a Vice-Chair for Undergraduate Education, Bill Griswold, as well as an active Undergraduate Committee. The Vice-Chair takes the lead on larger programmatic issues, such as curriculum development, and the Undergraduate Committee works on more topical issues. We were pleasantly surprised to hear that the Undergraduate Committee meets weekly, which shows a high level of dedication and responsiveness. It may make the Undergraduate Committee even more responsive were it to include undergraduates at appropriate meetings, for example, those dealing with curricular changes. The review committee noted that the composition of the faculty is lacking in diversity of underrepresented minorities. This is an issue that the department is aware of and is attempting to address, although without recent success.

Teaching duties are distributed among the faculty in a way that is viewed as equitable. A point system takes into account the differential workload of courses and service commitments, and there seemed to be no dissension about how such points were assigned. An innovative idea of having faculty lead a discussion session in another faculty member's course was mentioned. This would be an excellent means of enhancing contact between faculty and students. LSOE's are central to undergraduate education in the department, and in particular the upcoming 50% departure of Beth Simon may put a stress on the department. However, the ongoing recruitment of a new L(P)SOE should alleviate this stress. Non-senate lecturers are well integrated into the department and participate in faculty meetings as appropriate. As attested to by students, there are a number of excellent teachers in the department. And as indicated by the Vice-Chair through specific examples, poor teaching is taken seriously by the department.

B. Strengths and weaknesses of the curriculum

The academic quality of the faculty is high, as demonstrated by the 2010 NRC Study of Doctoral Programs (R ranking 5-95th percentile 8-27, S ranking 5-95th percentile 7-38). The curriculum is innovative and reflects the state of the art of computer science education. The requirements of the major have been streamlined to reflect the breadth of students majoring in CSE, with decreased requirements in Math, Physics, and Electrical Computing and Engineering. Balancing this were the addition of upper-divisional technical electives. The review committee viewed these as reasonable changes. Technical electives are structured as clusters (e.g., Artificial Intelligence Cluster, Bioinformatics Cluster, etc.), and the review committee saw the value in these but also wondered whether there should also be an option to allow students who did not easily fit within a particular cluster to customize a program that suited their needs. The committee realizes this may add an additional advising burden to an already over-stressed student advising office (see below). At the lower division level, CSE 3 (Fluency in Information Technology) has been completely redesigned and serves more than 1,000 students, the large majority of whom are non-majors. CSE 8A (Introduction to Computer Science: Java) and CSE 8AL have been redesigned to focus on media computation, and these changes have had a substantial effect on student retention. The changes to these courses bring the daily experience that students have with media into the classroom. The curriculum has also been responsive to the rapidly changing face of computer science,

and the department has instituted course offerings in the newly emerging areas of security, mobile computing, distributed computing (e.g., cloud, MapReduce), and multi-core computing.

One area of the curriculum that needs improvement involves leadership skills and oral presentations; current and past students reported a deficit in this aspect of their education. The review committee realizes this is a challenging request for this high enrollment major, but sees it as a necessity for the future success of students. It should be noted that the existing project-based software engineering course (CSE 110 Software Engineering) has a large team component, and includes both leadership and requirements for oral presentation. However, students reported a varying range of engagement with this course. Some activities were highlighted as being particularly effective (e.g., bringing in real-world users of the software being developed). The review committee encourages continuing and strengthening such efforts so that leadership and communication skills are taught in a context in which students are vested.

One of the more exceptional aspects of the department is the tutor program, which includes an average of 240 students per year. Tutors provide teaching assistance to the department on a paid basis, and this includes leading discussion sessions. It is clear they also gain greatly from this experience. Being a tutor is seen as a high honor, and there was an evident sense of camaraderie and community among the tutors. Indeed, a culture seems to have grown up around the experience. Companies see the experience that the tutors gain in communicating technical ideas to others as a major asset, and actively recruit tutors for internships. In general, the extensive participation of undergraduates in internships is an asset to department in that it provides a connection to current trends in industry. The tutor program is an area that receives financial support from departmental alumni. Unpaid positions in the Students Achieving, Guiding, Enriching (SAGE) program provide an entryway to the paid tutor positions, and due to this connection, SAGE positions are also valued. In addition, the department utilizes graders, who likewise serve on an unpaid basis. This position is also seen as one with honor attached to it, and graders benefit by developing closer interactions with faculty.

The review committee heard from Teaching Assistants that one area for improvement is feedback from faculty on their performance. Faculty reportedly provide feedback only occasionally. The review committee also heard that an award for teaching excellence by Teaching Assistants had lapsed. The review committee encourages this recognition to be reinstated. Another concern, which is perhaps not specific to the department, is the excessive workload found in certain teaching assignments. It was also noted that 10-hour (25%) Teaching Assistantships are problematic, in that the workload for such partial positions is much greater than 10 hours. Lastly, a source of concern was the large number of quarters that certain students had spent being Teaching Assistants (apparently as great as 27).

C. Department in the context of campus and University policies

Enrolment in the CSE major is fairly large (~790 in 2009) and appears to be cyclical, and now is perhaps in the rising phase. The prior rising phase led to the CSE major being granted impacted status, and the department is getting set to seek such status imminently. The department is aware that restricting the major should not come at the cost of diminishing the diversity of students in the major.

Student advising is highly valued by students and faculty alike, but the office that carries out this function is greatly stressed. The increasing number of students and a recent decrease in office staff have led to this condition. The review committee was concerned that if the present situation were to continue much longer, a staff that is enthusiastic and dedicated may begin to lose these qualities. Certain faculty are keen to provide help with advising, and this might alleviate some of the pressures on the advising office.

The student advising staff reported that transfer students were satisfied with their experience in the department, but the review committee was not given a chance to meet with transfer students. Efforts should be made to ensure that this occur at the next review.

A notable limitation seen by the faculty was the state of the undergraduate lab. They noted that the computers in the lab are six years old and, as maintained by Academic Computing and Media Services (ACMS), not customizable to particular operating systems (e.g., Linux) and other software. The latter is a particular problem with upper division courses. The department would like to operate the lab under the

aegis of their own staff in preference to ACMS. However, the department also noted that it does not receive enough laboratory funding to do so. It is understandable that two entities with the same core expertise (i.e., the department and ACMS) may not see eye-to-eye. Further, some faculty noted that space in the undergraduate lab is another limiting factor. These are large problems and will require the department working with the administration to sort out.

Another source of concern by the faculty was the availability of classrooms. The faculty as a whole prefer 1 hour and 20 minute class sessions, and not enough courses can be accommodated given the number of available classrooms. This is a general University-wide problem.

D. Recommendations

1. Increase the number of underrepresented minorities in the major with emphasis on increasing retention rates, in part through the recruitment of faculty who can serve as effective role models for underrepresented minorities students.
2. Allow for custom programs of study for students whose interests do not easily fit within a cluster.
3. Include students in relevant Undergraduate Committee meetings.
4. Institute more oral presentations as part of the curriculum.
5. Ensure Teaching Assistants receive regular evaluations from faculty.
6. Reinstate awards for excellence in teaching for Teaching Assistants.
7. Find mechanisms for relieving the high workload on the student advising office.
8. Address the issues (age, customizability) of the undergraduate lab computers.