2008-2009
Assessment Report

Department of Computer Science
California State University, Sacramento

Du Zhang, Department Chair

Assessment Committee:
Robert Buckley
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Option 1: Narrative Submission

Refinement of Program Educational Objectives and Student Learning Outcomes

During AY 2008-2009, the CSC Assessment Committee reviewed and refined its program educational objectives (objectives) and student learning outcomes (outcomes) to better align objectives and outcomes.

Program Educational Objectives

Minor modifications were made to objectives 1 (proficiency in computing systems) and 5 (written communication) and their descriptions were simplified. The revised objectives were presented to the department faculty and, later, to the department’s Industry Advisory Committee (IAC) at the May 1, 2009 meeting for review. The IAC recommended that the oral and written communication objectives, objectives 5 and 6, be more broadly stated. The Assessment Committee incorporated these changes. The updated program objectives are presented below.

Graduates of the program will

1. Demonstrate proficiency in the design, development, maintenance, and support of computing systems.
2. Be effective and contributing members of project teams.
3. Engage in the pursuit of professional development opportunities and/or pursue graduate studies.
4. Assume leadership roles in their chosen career and profession.
5. Write effectively.
6. Have effective oral communication skills.
7. Abide by the ethical standards of the profession and understand the ethical, social, and global implications of their professional activities.

The department’s program educational objectives were also examined in light of the University’s baccalaureate learning goals. It was concluded that our program objectives are in alignment with the University’s baccalaureate learning goals as indicated in the Program Objectives/University Mission matrix in attachment A.

Student Learning Outcomes

Student learning outcomes were refined by combining similar and related outcomes, rewording other outcomes, and dividing the effective communication into two outcomes: oral communication and written communication. This process reduced the total number of outcomes from eleven to nine. The revised outcomes were also reviewed by the IAC. As with objectives, the IAC recommended that oral and written communication outcomes be broadly stated. The revised student learning outcomes are given below. Corresponding ABET/CAC outcomes are in italics.

At the time graduation, students will have the ability to
(a) Apply knowledge of mathematics, algorithmic principles, computer theory, and principles of computing systems in the modeling and design of computer-based systems that demonstrate an understanding of tradeoffs in design choices.  
(b) Analyze a problem, specify requirements, design, implement, and evaluate a computer-based system, process, component, or program that satisfies the requirements.  
(c) Apply design and development principles in the construction of software systems of varying complexity.  
(d) Use current skills, techniques, and tools necessary for computing practice.  
(e) Function effectively as a member of a team to accomplish a common goal.  
(f) Understand professional, ethical, legal, social, and security issues and responsibilities; analyze the impact of computing on individuals, organizations, and society both locally and globally.  
(g) Write effectively.  
(h) Speak effectively.  
(i) Recognize the need for, and have an ability to engage in, continuing professional development.  

The abbreviated descriptive form of student learning outcomes, presented below, will be used in the remainder of this report.

Abbreviated Descriptions for Student Learning Outcomes

(a) Application of knowledge  
(b) Computer system development cycle  
(c) Application of software development principles  
(d) Skills and techniques for computing practice  
(e) Team work  
(f) Professional and ethical issues and responsibilities  
(g) Written communication  
(h) Oral communication  
(i) Life-long learning  

Mappings of Objectives/Outcomes and Outcomes/Core Courses are provided in the attachment B and attachment C, respectively.

1. What goals or learning objectives/outcomes were assessed in AY 2008-2009?

In addition to the assessment of program objectives and learning outcomes, the CSC Department refined objectives and outcomes and developed assessment plans for both objectives and outcomes.  The assessment activities for 2008-2009 are as follows:  

A. Refinement of objectives and outcomes.  
B. Development of an assessment plan for objectives.  
C. Assessment of objectives 2, 3, and 7.  
D. Development of an outcome assessment plan.  
E. Assessment of outcomes (a) – (f) and (i).  

A. Refinement of Objectives and Outcomes
In Fall 2008, the CSC department reviewed and revised the descriptions of objectives and outcomes to better align them. To reference the revised objectives and outcomes that were subsequently used in Spring 2009, this section is presented at the beginning of this report.

**B. Development of an Assessment Plan for Objectives**

The 3-Year Assessment Plan for Objectives is presented in Table 1 below. Each objective will be assessed at least once every three years. The department has completed the first year of this plan.

<table>
<thead>
<tr>
<th>Year</th>
<th>Objectives Assessed</th>
<th>Source of Data</th>
<th>Assessment Method(s)</th>
<th>Continuous Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>Be effective team members. (2)</td>
<td>Industry Advisory Committee</td>
<td>Focus Group</td>
<td>Review by department faculty.</td>
</tr>
<tr>
<td></td>
<td>Engage in professional development opportunities. (3)</td>
<td>Industry Site Visit</td>
<td>Survey</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Abide by ethical standards of the profession. (7)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second</td>
<td>Be proficient in the design, development, maintenance, and support of computing systems. (1)</td>
<td>Industry Advisory Committee</td>
<td>Focus Group</td>
<td>Review by department faculty.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Industry Site Visit</td>
<td>Survey</td>
<td></td>
</tr>
<tr>
<td>Third</td>
<td>Assume leadership roles. (4)</td>
<td>Industry Advisory Committee</td>
<td>Focus Group</td>
<td>Review by department faculty.</td>
</tr>
<tr>
<td></td>
<td>Write effectively. (5)</td>
<td>Industry Site Visit</td>
<td>Survey</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Have effective oral communication skills. (6)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**C. Assessment of Objectives 2, 3, and 7.**

*Data Source*

The objectives related to
- Team work (2)
- Life-long learning (3)
- Professional and ethical issues and responsibilities (7)

were assessed on May 21, 2009 during an industry on-site visit with Northrop Grumman Corporation (NGC). Coordinated by the College Director of Career Services Cici Mattuizzi, five CSC faculty members participated. Ten employees, all graduates of our B.S. CSC program, were interviewed. Employees were asked to respond to a set of questions related to the three objectives. (See attachment D.) Most of the employees (8 out of 10) were graduates of our B.S. CSC program in the last two years. One was a
graduate 5 years ago and one was a manager with a B.S. in CSC 18 years ago and a M.S. in CSC 11 years ago. Given this mix of work experience, their responses were treated as data related to objectives (input from two employees who graduated at least five years ago) and outcomes (input from employees who graduated in past two years). Input from the latter will be discussed in Section 2 of this report.

**Objective 2. Be an effective and contributing member of project teams.**

*Results and Discussion:*
CSC 190/191 Senior Project I/II were cited as the most valuable courses in the CSC curriculum providing students with real life experience working in a team environment. Responses of the more senior employees indicate that they believe our graduates perform well in a team environment. Our graduates are able to cooperate and contribute equally as team members. They communicate well with their team. When faced a conflict situation, they seek guidance and participate in the resolution of conflict among team members.

*Conclusion/Recommendation:*
Our graduates are effective and contributing members of project teams.

**Objective 3. Engage in the pursuit of professional development opportunities and/or postgraduate studies.**

*Results and Discussion:*
NGC provides support for seminars and training for its employees. Tuition support for advanced degrees in computer science is provided. Our graduates take advantage of this support and seek training in the use of new software applications as needed. They are also aware that they may have to learn “on their own” or seek assistance from knowledgeable employees working on other projects. Six of nine employees are definitely or are seriously considering taking graduate CSC courses.

*Conclusion/Recommendation:*
Our graduates are aware of the need for professional development and pursue various opportunities for continuous learning.

**Objective 7. Abide by the ethical standards of the profession and understand the ethical, social, and global implications of their professional activities.**

*Results and Discussion:*
Employees indicate that our graduates are aware of professional and ethical issues and what their responsibilities are.

*Conclusion/Recommendation:*
Our graduates appear to have an understanding of their professional and ethical responsibilities.

Results of the assessment of objectives and outcomes by our industry constituents over the past three years are summarized in Table 2 below.
<table>
<thead>
<tr>
<th>Constituent Providing Feedback</th>
<th>Assessment Methods</th>
<th>Time of Data Collection and Assessment</th>
<th>Objectives/Outcomes Assessed</th>
<th>Evaluation of Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry Advisory Committee (IAC) Meeting</td>
<td>Focus Group</td>
<td>Spring 2007</td>
<td>Objectives developed.</td>
<td>IAC list of objectives matched 5 of 7 CSUS CSC objectives. Two objectives not on IAC list are life-long learning and leadership role in profession.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Spring 2009</td>
<td>Objectives reviewed.</td>
<td>IAC endorse list of objectives and recommend oral and written communication be broadly stated.</td>
</tr>
<tr>
<td>Industry Site Visit</td>
<td>Survey</td>
<td>Spring 2007 at Accenture</td>
<td>All outcomes</td>
<td>Recent graduates perform at satisfactory level or above for all outcomes.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Spring 2008 at Vision Service Plan</td>
<td>All objectives</td>
<td>Graduates satisfy all program objectives except written communication which was not addressed due to time constraints.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Spring 2009 at Northrop Grumman Corporation</td>
<td>Objectives/outcomes: Team work Life-long learning Professional and ethical issues</td>
<td>Graduates satisfy the three objectives/outcomes: Team work Life-long learning Professional and ethical issues</td>
</tr>
</tbody>
</table>
D. Development of Outcome Assessment Plan

Table 3 represents the CSC department’s 3-Year Plan for Outcome Assessment. The department has just completed the first year of this plan.

Table 3. Three-Year Plan for Outcome Assessment

<table>
<thead>
<tr>
<th>Year</th>
<th>Outcomes assessed</th>
<th>Courses</th>
<th>Data collected</th>
<th>Continuous improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Application of knowledge (a)</td>
<td>Outcomes (a) – (d) assessed in the following core courses: CSC 130, 131, 132, 133, 134, 136, 137, 138, 139, 190, and 191.</td>
<td>Course embedded exam questions Assignments</td>
<td>Analysis of previous year’s results and recommendations for actions. Implementation of previously recommended actions. Review and refinement of learning outcomes.</td>
<td></td>
</tr>
<tr>
<td>Computer system development cycle (b)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Application of software development principles (c)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skills and techniques for computing practice (d)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Team work (e)</td>
<td></td>
<td>Instructor and student evaluations Written essays</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Written communication (g)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral communication (h)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Second</strong></td>
<td></td>
<td></td>
<td>Analysis of previous year’s results and recommendations for actions. Implementation of previously recommended actions.</td>
<td></td>
</tr>
<tr>
<td>Application of knowledge (a)</td>
<td>Outcomes (a) – (d) assessed in selected electives from the following areas: • Architecture • Computer games and graphics • Database and data mining • Information security • Intelligent systems • Software engineering • Operating systems and compiler</td>
<td>Course embedded exam questions Assignments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer system development cycle (b)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Application of software development principles (c)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skills and techniques for computing practice (d)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Team work (e)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Written communication (g)</td>
<td></td>
<td>Faculty and student evaluations Written essays Oral presentations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral communication (h)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Third</strong></td>
<td></td>
<td></td>
<td>Analysis of previous year’s results and recommendations for actions. Implementation of previously recommended actions.</td>
<td></td>
</tr>
<tr>
<td>Professional and ethical issues and responsibilities (f)</td>
<td>CSC 190 and 191, Phil 103</td>
<td>Surveys Written essays</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Written communication (g)</td>
<td>CSC 131, 190, 191</td>
<td>Written essays</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral communication (h)</td>
<td>CSC 131, 190, 191</td>
<td>Oral presentations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Life-long learning (i)</td>
<td>CSC 194, 195, 195 A-D, CSC 199</td>
<td>Reports, Employer Evaluations</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2. How were these learning outcomes assessed?
   a. Describe the measures you used and the information gathered.
      (Description, date administered, results)

Assessment of Outcomes – Mechanisms Used
Various mechanisms were employed in our assessment of student learning outcomes. The mechanisms, used to measure how well students satisfy performance criteria for a given outcome, include the following:
(1) Evaluation of selected topics, embedded as questions in midterms or final exams, is used to assess students’ knowledge of computer science core topics
(2) Evaluation of student essays (e.g., professional and ethical issues, written communication)
(3) Peer evaluations (e.g., team work)
(4) Faculty evaluations (all outcomes)
(5) Industry visits and surveys (selected outcomes – see table 2. above)
(6) Graduating senior surveys (selected outcomes)

CSC Department Minimum Percentage for Satisfying a Performance Criterion
The Department has established a standard of 75% to be used as the minimum at which a criterion is considered to be satisfied. That is, at least 75% of the students must meet or exceed a performance criterion in order for that criterion to be considered satisfied. Using the following scoring method:

4 - Exceeds criteria,
3 – Meets criteria,
2 – Progressing to criteria,
1 – Fails to meet criteria,

a criterion is said to be met if at least 75% of the students assessed receive a score of 3 or 4.

E. Assessment of Outcomes (a) – (f) and (i).

Outcomes (a) through (f) and (i) were assessed in 2008-2009. That is, all outcomes, except written and oral communications, were assessed. However, the results for outcomes (g) written communication and (h) oral communication, assessed in 2007-2008, have been updated and are included here for completeness.

(a) Application of knowledge
(b) Computer system development cycle
(c) Application of software development principles
(d) Skills and techniques for computing practice
(e) Team work
(f) Professional and ethical issues and responsibilities
(i) Life-long learning
Assessment was conducted on these seven learning outcomes in upper division core courses. Sources of assessment data were:
1. Outcomes (a) to (d) - questions embedded in midterm/final exams in CSC core courses 130-139. Student responses to the questions were evaluated by two faculty members.
2. Outcome (e) Team work – analysis of student survey results
3. Outcome (f) Professional and ethical issues and responsibilities – faculty evaluation of student essays in Phil 103 Business and Computer Ethics
4. Outcome (i) Life-long learning – interview of recent graduates
5. Outcome (g) Written communication – faculty evaluation of student essays using a rubric
6. Outcome (h) Oral communication – faculty evaluation of senior project presentations using a rubric

The process of evaluating CSC core topics in core courses was initiated Spring 2008 when questions were identified for CSC 134, 137, and 138. In Fall 2008, questions were selected for the remaining core courses: CSC 130, 131, 132, 133, 136, 139, and Phil 103. Faculty evaluation of student responses to these questions, embedded in exams, was conducted at the CSC department retreat in January 23, 2009. At a discussion of the results of faculty evaluations at our last department meeting on May 13, 2009, the faculty raised concerns about the process implemented. These concerns include:

- Performance criteria were not in place when questions were selected. So the issue: “Does the question support the criterion and does the criterion support the outcome to be assessed?” was not fully discussed by the faculty.
- Level of difficulty of the questions was not standardized. Questions developed by faculty tended to be either fairly easy or somewhat difficult.
- Choice of questions may not be representative of the knowledge required of students in the course.
- There were discrepancies in the grading process between faculty evaluators. Although an attempt was made to conduct some “norming” of the evaluation process before grading, disagreements in grading policies were not always resolved prior to evaluation.

In light of these concerns regarding the process implemented this year, it was recommended that the process be evaluated and the concerns addressed before the assessment of core topics in upper division elective courses next academic year. In addition, the department will reflect on those performance criteria that do not meet the 75% minimum standard. A decision to ask a different but related question for the same performance criterion in a related (and subsequent) elective course in 2009-2010 may be considered. Finally, general conclusions will be made for some of the outcomes assessed.

Results of the assessment of all outcomes are provided below. $n =$ number of students assessed and may represent the number of students enrolled in a class section or the total number of students in all sections of a core course.
Application of Knowledge

Table 4. Results of Assessment of Outcome (a): Application of knowledge

<table>
<thead>
<tr>
<th>Performance Criteria</th>
<th>Source of Assessment Data *</th>
<th>Assessment Methods</th>
<th>Date of Data Collection</th>
<th>Date of Evaluation</th>
<th>Faculty Evaluator(s)</th>
<th>% Students Meeting Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Knows time complexity of algorithms $(n = 17)$</td>
<td>CSC 130</td>
<td>Faculty Evaluations</td>
<td>Fall 2008</td>
<td>Spring 2009</td>
<td>Jones Radimsky</td>
<td>77%</td>
</tr>
<tr>
<td>2. Understands fundamental algorithms $(n = 27)$</td>
<td>CSC 130</td>
<td>Faculty Evaluations</td>
<td>Fall 2008</td>
<td>Spring 2009</td>
<td>Jones Radimsky</td>
<td>55%</td>
</tr>
<tr>
<td>3. Understands finite state machines $(n = 38)$</td>
<td>CSC 132</td>
<td>Faculty Evaluations</td>
<td>Fall 2008</td>
<td>Spring 2009</td>
<td>Faroughi Krovetz</td>
<td>70%</td>
</tr>
<tr>
<td>4. Understands context-free grammars $(n = 38)$</td>
<td>CSC 132</td>
<td>Faculty Evaluations</td>
<td>Fall 2008</td>
<td>Spring 2009</td>
<td>Faroughi Krovetz</td>
<td>96%</td>
</tr>
<tr>
<td>5. Applies relational algebra $(n = 30)$</td>
<td>CSC 134</td>
<td>Faculty Evaluations</td>
<td>Spring 2008</td>
<td>Spring 2009</td>
<td>Gordon Mitchell</td>
<td>82%</td>
</tr>
</tbody>
</table>

* Test-embedded questions

Discussion:
Minimum standard of 75% was satisfied for performance criteria 1, 4, and 5 and not for performance criteria 2 and 3.

Conclusion/Recommendation:
Since algorithms and finite state machines are fundamental core topics in computer science, it is recommended that these two performance criteria be assessed in related elective course(s) next year after concerns with the current assessment process have been addressed.

Computer System Development Cycle

Table 5. Results of Assessment of Outcome (b): Computer system development cycle

<table>
<thead>
<tr>
<th>Performance Criteria</th>
<th>Source of Assessment Data *</th>
<th>Assessment Methods</th>
<th>Date of Data Collection</th>
<th>Date of Evaluation</th>
<th>Faculty Evaluator(s)</th>
<th>% Students Meeting Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Understands Moore finite state diagrams and circuit diagrams $(n = 27)$</td>
<td>CSC 137</td>
<td>Faculty Evaluations</td>
<td>Spring 2008</td>
<td>Spring 2009</td>
<td>Freund Lan</td>
<td>85%</td>
</tr>
<tr>
<td>2. Understands cache memory mapping and hit ratio $(n = 27)$</td>
<td>CSC 137</td>
<td>Faculty Evaluations</td>
<td>Spring 2008</td>
<td>Spring 2009</td>
<td>Freund Lan</td>
<td>48%</td>
</tr>
<tr>
<td>3. Understands concurrency $(n = 39)$</td>
<td>CSC 139</td>
<td>Faculty Evaluations</td>
<td>Spring 2008</td>
<td>Spring 2009</td>
<td>Ghansah Ouyang</td>
<td>86%</td>
</tr>
<tr>
<td>4. Understands paging system $(n = 39)$</td>
<td>CSC 139</td>
<td>Faculty Evaluations</td>
<td>Spring 2008</td>
<td>Spring 2009</td>
<td>Ghansah Ouyang</td>
<td>75%</td>
</tr>
</tbody>
</table>
Discussion:
Minimum standard of 75% was satisfied for all performance criteria except for criterion 2. (Understands cache memory mapping and hit ratio).

Conclusion/Recommendation:
Reflect and decide whether to re-examine performance criterion 2 in elective courses next year. In general, students appear to be knowledgeable about computer systems development.

Application of Software Development Principles

Table 6. Results of Assessment of Outcome (c): Application of software development principles

<table>
<thead>
<tr>
<th>Performance Criteria (n=13)</th>
<th>Source of Assessment Data *</th>
<th>Assessment Methods</th>
<th>Date of Data Collection</th>
<th>Date of Evaluation</th>
<th>Faculty Evaluators</th>
<th>% Students Meeting Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Understands four design models in software development</td>
<td>CSC 131</td>
<td>Faculty Evaluations</td>
<td>Fall 2008</td>
<td>Spring 2009</td>
<td>Jin Mitchell</td>
<td>65%</td>
</tr>
<tr>
<td>2. Knows four common types of data/control coupling</td>
<td>CSC 131</td>
<td>Faculty Evaluations</td>
<td>Fall 2008</td>
<td>Spring 2009</td>
<td>Jin Mitchell</td>
<td>92%</td>
</tr>
</tbody>
</table>

* Test-embedded questions

Discussion:
Performance criterion 2 was satisfied, but criterion 1 (Understands the four design models in software development) did not meet the minimum standard of 75%.

Conclusion/Recommendation:
Reflect and decide whether to re-examine performance criterion 1 in elective courses next year.

Skills and Techniques for Computing Practice

Table 7. Results of Assessment of Outcome (d): Skills and techniques for computing practice

<table>
<thead>
<tr>
<th>Performance Criteria</th>
<th>Source of Assessment Data *</th>
<th>Assessment Methods</th>
<th>Date of Data Collection</th>
<th>Date of Evaluation</th>
<th>Faculty Evaluators</th>
<th>% Students Meeting Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Understands design patterns of O-O programming (n = 25)</td>
<td>CSC 133</td>
<td>Faculty Evaluations</td>
<td>Fall 2008</td>
<td>Spring 2009</td>
<td>Arad Wang</td>
<td>71%</td>
</tr>
<tr>
<td>2. Programs a GUI using O-O programming (n = 25)</td>
<td>CSC 133</td>
<td>Faculty Evaluations</td>
<td>Fall 2008</td>
<td>Spring 2009</td>
<td>Arad Wang</td>
<td>82%</td>
</tr>
<tr>
<td>3. Develops a SQL query (n = 30)</td>
<td>CSC 134</td>
<td>Faculty Evaluations</td>
<td>Spring 2008</td>
<td>Spring 2009</td>
<td>Gordon Mitchell</td>
<td>68%</td>
</tr>
<tr>
<td>4. Understands parameter</td>
<td>Faculty</td>
<td></td>
<td></td>
<td></td>
<td>Cook</td>
<td></td>
</tr>
</tbody>
</table>
Of the six performance criteria assessed, two criteria, 1 and 3, are slightly below the minimum. Remaining criteria percentages are relatively high.

**Conclusion/Recommendation:**
In general, outcome (d) appears to be satisfied. Questions used to assess criteria 1 and 3 will be reviewed next year.
Team Work

At the end of Spring 2009 semester, CSC 191 students completed a survey regarding their experiences as members of a team. (See attachment E.) The Assessment Committee focused on responses to four (of the ten) questions which addressed the performance criteria in Table 8.

Source of assessment data: CSC 191 student surveys – peer evaluation
Date of data collection: Spring 2009
Date of evaluation: Spring 2009
Faculty evaluators: Buckley, Lee

Table 8. Results of Assessment of Outcome (e): Team work

<table>
<thead>
<tr>
<th>Performance Criteria</th>
<th>% Students Meeting Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Cooperates and collaborates as a team member</td>
<td>84%</td>
</tr>
<tr>
<td>2. Communicates and listens; keeps teammates informed</td>
<td>75%</td>
</tr>
<tr>
<td>3. Faces conflicts and resolves differences</td>
<td>56%</td>
</tr>
<tr>
<td>4. Contributes equally as a participant in the project</td>
<td>88%</td>
</tr>
</tbody>
</table>

Discussion
Percentages reflect student opinions derived from student surveys. These results, representing peer and self evaluation, are consistent with what senior project instructors have observed throughout the years: (1) almost all students cooperate and participate as team members, (2) team members communicate and keep team members informed although not as often or as effectively as they wish, (3) they are reluctant to confront and resolve conflicts within the team, and (4) almost all team members share the workload.

At NGC, employees believe that while team work may not be easy due to personalities, communication among team members is good and graduates of our program “team together effectively”. As mentioned earlier under program objectives, most believed that they are able to resolve conflicts.

Conclusion/Recommendation:
Graduates are able to contribute as members of a project team. Although it appears that as students in CSC 190/191, they do not feel they are able to handle issues where conflicts occur, as graduates, they are relatively confident that they can address such situations.
Professional and Ethical Issues and Responsibilities

Phil 103 Business and Computer Ethics is a required course for CSC majors. Student essays, written as part of a midterm and final exam, were evaluated by two CSC faculty.

Source of assessment data: Phil 103 student essays
Date of data collection: Fall 2008
Date of assessment: Spring 2009
Faculty evaluators: Lee, Smith

Table 9. Results of Assessment of Outcome (f): Professional and ethical issues and responsibilities

<table>
<thead>
<tr>
<th>Performance Criteria</th>
<th>% Students Meeting Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Able to describe a recent work-related situation that created a moral conflict and explain how the conflict was resolved. ( n = 10 )</td>
<td>85%</td>
</tr>
<tr>
<td>2. Able to describe a conflict between two different moral values and explain how the conflict was resolved. ( n = 12 )</td>
<td>96%</td>
</tr>
</tbody>
</table>

Discussion:
Students wrote 3-page essays explaining what moral principles, values, or considerations are used to guide them when they are faced with a moral conflict. (See attachment F.)

At NGC, recent graduates indicated that Phil 103 was not useful in terms of coverage of professional and ethical issues. However, two of the eight graduates who took the course from Prof. Justin indicated that the course was quite informative. Data for this assessment was collected from Prof. Justin’s class. All NGC employees stated that they are aware of professional and ethical issues.

Conclusion/Recommendation:
The results of assessment of student essays reveal that Phil 103, as taught by Prof. Justin, provided good coverage of moral values and how moral conflicts can be resolved. Student essays reflected good understanding of the issues. In addition, recent graduates at NGC believe that they have an awareness and understanding of their ethical responsibilities.

The assessment of professional and ethical issues and responsibilities with regard to Phil 103 has led the department to realize that the scope of coverage needs to be further expanded, especially in areas of professional and security issues and responsibilities, and the global impact of computing on individuals, organizations, and society as a whole. Initial contact with Department of Philosophy on the issue of expanding coverage in Phil 103 drew a positive response. The department will work with the Philosophy department on this issue in the upcoming academic year.
Life-long Learning

**Outcome (i) Life-long learning**

*Results and Discussion:*
At NGC, recent graduates recognize that sharing work and information is important for industry employees in order to get their work done. Seeking information and support from colleagues even those outside of a person’s team, learning on your own, attending seminars, and taking graduate courses are recognized as ways to continuous learn and be successful. (See results for Objective 3.)

*Conclusion/Recommendation:*
Our graduates appear to recognize the need and have the ability to pursue learning opportunities.

*Following are updated results for written and oral communications from 2007-2008.*

**Written Communication**

CSC 190/191 is a required two-semester sequence of senior project courses for computer science majors. Two-page writing essays by CSC 191 students representing individual student reflections of project team experiences over two semesters of senior project were assessed. A written communication rubric, developed by the College of Engineering and Computer Science (ECS) assessment committee in Fall 2007, was implemented in Fall 2007 and Spring 2008. (See attachment G for the rubric.) Due to the engineering emphasis of the rubric, several criteria were not applicable to CSC and, therefore, were not assessed. Four essays were selected at random.

Source of assessment data: CSC 191 student essays – peer evaluation
Date of data collection: Spring 2006.
Date of assessment: Spring 2008
Faculty evaluators: Gordon, Krovetz, Lee, Mitchell

The results are presented in Table 10 below.
Table 10. Results of Assessment of Outcome (g): Written communication

<table>
<thead>
<tr>
<th>Performance Criteria</th>
<th>% Students Meeting Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Organization and transitions</td>
<td>75%</td>
</tr>
<tr>
<td>2. Syntax, sentence structure, and standard English</td>
<td>73%</td>
</tr>
<tr>
<td>conventions</td>
<td></td>
</tr>
<tr>
<td>3. Paragraph structure</td>
<td>73%</td>
</tr>
<tr>
<td>4. Problem statement</td>
<td>Not applicable</td>
</tr>
<tr>
<td>5. Design requirements and specification</td>
<td>Not applicable</td>
</tr>
<tr>
<td>6. Design process</td>
<td>Not applicable</td>
</tr>
<tr>
<td>7. Status of project</td>
<td>Not applicable</td>
</tr>
<tr>
<td>8. Summary and conclusion</td>
<td>80%</td>
</tr>
</tbody>
</table>

Discussion:
Students satisfied criteria in the following areas:
- organization and transitions
- summary and conclusion

and were just slightly below our benchmark in
- syntax, sentence structure, and standard English conventions
- paragraph structure

Conclusions/Recommendations:
In general, CSC students appear to satisfy standard criteria for effective writing with some improvement needed in syntax, sentence/paragraph structure, and standard English conventions.

May 2009 Update: In Spring 2006, the university Faculty Senate Writing and Reading Subcommittee, in response to a mandate from the Senate to improve the content and sequencing of students’ experiences as writers, proposed a variety of changes to the Comprehensive Writing Program that were subsequently approved by the Senate and university President Gonzalez. The university-wide changes to Graduation Writing Assessment Requirement (GWAR), to be fully implemented in Fall 2009, have direct impact on the written communication outcome in our program. In view of this, the department assessment committee has decided to wait until the new GWAR takes its full effect and re-assesses the situation (in the areas of syntax and sentence structure, standard
English conventions, and paragraph structure) before any curriculum actions are contemplated to address the issues.

**Oral Communication**

Oral presentations by all students as members of senior project teams are required in CSC 190 and 191. An oral communication rubric was developed in a joint effort by the ECS assessment committee and the CSC assessment committee. This rubric (see Attachment H) was implemented Fall 2007 in the following courses. Faculty assessors are in parentheses.

- CSC 131 Computer Software Engineering (CSC faculty)
- CSC 190 Senior Project: Part I (CSC faculty)
- CSC 191 Senior Project: Part II (ECS faculty)

and Spring 2008 in CSC 191 (CSC faculty).

Evaluations in CSC 131 and CSC 190 in Fall 2007, and CSC 191 in Spring 2008 were conducted by CSC faculty members. Both CSC and engineering faculty participated in the Fall 2007 assessment of CSC 191.

Satisfactory performance was defined as follows: 75% or more of the students meet criteria (score of 3) or exceed criteria (score of 4). Summary results are given in Table 11 below.
Table 11. Results of Assessment of Outcome (h): Oral communication

<table>
<thead>
<tr>
<th>Performance Criteria</th>
<th>CSC 131 (n=28) Evaluators: CSC Faculty</th>
<th>CSC 190 (n=10) Evaluators: CSC Faculty</th>
<th>CSC 191 (n=40) Evaluators: CSC Faculty</th>
<th>CSC 191 (n=14) Evaluators: ECS Faculty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Organization</td>
<td>Introduction, body, conclusion not clearly delineated.</td>
<td>Main points not clearly identified and concisely presented.</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>2. Delivery</td>
<td>Does not maintain eye contact.</td>
<td>Does not attract and hold interest of the audience. Does not present material with confidence. Does not maintain eye contact</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>3. Language and Vocabulary</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>4. Appearance</td>
<td>Attire is not neat or professional.</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>5. Technical Content</td>
<td>Does not identify related applications.</td>
<td>None</td>
<td>Does not identify related applications.</td>
<td>None</td>
</tr>
</tbody>
</table>

Discussion:
Table 1 represents areas of deficiencies within each of the five major performance criteria. For Fall 2007, CSC 131 results indicate that students perform generally well in organization, language and vocabulary, and technical content. Improvements are needed in specific areas of delineating the presentation into introduction, body, and conclusion, maintaining eye contact, and identifying of related work. CSC 190 results indicate strength in organization, language and vocabulary, appearance, and technical content. Major improvements are needed in stating the main points of the talk and in delivery. Students in CSC 191 performed very well and met or exceeded criteria in all categories with the exception of citing related work.

Conclusions/Recommendations at end of Fall 2007:
The department considered alternative ways to close the loop from developing a 1-unit course to developing an instructional module on techniques of effective presentations.
Recognizing the difficulty of adding one additional unit to our already high unit degree requirements, the latter approach was implemented.

**Closing the Loop/Program Improvement in Spring 2008:**
During Spring 2008 semester, the CSC 191 lab instructor presented a module on effective oral presentations in all CSC 191 lab sections. These were the same students assessed last semester in CSC 190. Using the same oral communication rubric, presentations were assessed by CSC faculty at the end of Spring 2008. A comparison of those performance criteria in Fall 2007 below the 75% benchmark and their corresponding Spring 2008 results is provided in the Table 12 below.

**Table 12. Percentage of Students Who Meet or Exceed Criteria for Outcome (b) Effective oral presentations**

<table>
<thead>
<tr>
<th>Performance Criteria</th>
<th>CSC 190 Fall 2007</th>
<th>CSC 191 Spring 2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main points are clearly identified &amp; concisely presented</td>
<td>68%</td>
<td>92%</td>
</tr>
<tr>
<td>Attracts and holds the interest of the audience</td>
<td>62%</td>
<td>100%</td>
</tr>
<tr>
<td>Presents material effectively with confidence &amp; enthusiasm</td>
<td>71%</td>
<td>100%</td>
</tr>
<tr>
<td>Maintains eye contact throughout presentation</td>
<td>71%</td>
<td>93%</td>
</tr>
</tbody>
</table>

**Discussion:**
As a result of the additional material on presentation techniques, all CSC 190 deficiencies in performance in Fall 2007 were eliminated in the CSC 191 in Spring 2008. In addition, all other percentages remained above the 75% benchmark and some exceeded percentages in CSC 190 indicating higher levels of meeting or exceeding performance criteria. Thus, all performance criteria in oral presentations were satisfied. (See the last column of Table 11.)

**Conclusions/Recommendations at end of Spring 2008:**
A lecture on effective oral presentation techniques should be included in CSC 131, 190, and 191 and any other course requiring oral presentations in our program.

b. **As a result of these assessments, what did you learn about the program’s success in helping its students achieve these learning outcomes?**

In general, CSC has been relatively successful in helping students achieve our learning outcomes. Faculty evaluations, student/peer evaluations, and interviews with industries that hire our graduates attest to that. According to Elaine Butler, a senior software engineer at Northrop Grumman Corporation, “CSUS graduates are at the top as to what they bring to the table” as new hires. Our senior project sequence provides students with valuable experience in software development life cycle and team experience.

c. **In what areas are students doing well and achieving expectations?**

Our assessment efforts this year indicate that our students are achieving expectations in the following outcomes:

(b) Computer system development cycle
Skills and techniques for computing practice
Team work
Professional and ethical issues and responsibilities
Life-long learning

Outcome (h) oral communication is satisfied while some improvement is needed in outcome (g) writing regarding syntax, sentence and paragraph structure.

d. What areas are seen as needing improvement within your program?

Our procedure for assessing CSC core topics in our required courses needs to be reviewed and revised before any conclusions can be made in assessing how our students are performing in the following outcome areas:
(a) Application of knowledge
(c) Application of software development principles

3. As a result of faculty reflection on these results, are there any program changes anticipated?

Given that performance in outcomes (a) and (c) are generally positive, but inconclusive, we do not plan on making program changes until we have had an opportunity to more systematically assess core topics in outcomes (a) and (c).

a. If so, what are those changes?

NA

b. How will you know if those changes achieve the desired results?

NA

4. Did your department engage in any other assessment activities, such as, the development of rubrics, course alignment?

No.

5. What assessment activities are planned for the upcoming academic year?

For 2009-2010, consistent with our assessment plans, the CSC department proposes to undertake the following:

1. Assess objective 1 (Demonstrate proficiency in the design, development, maintenance, and support of computing systems.)
2. Develop a process to evaluate core topics:
   • Identify fundamental performance criteria for outcomes, in particular for outcomes (a) through (d)
• Develop questions which assess the performance criteria
• Research procedures for “norming” the evaluation of student answers among evaluators and provide a training session for faculty

3. After Part 2 has been tested, evaluate student performance in core knowledge areas in select upper division CSC elective courses (CSC courses numbered 140 and above). Outcomes (a) – (d) will be assessed. Outcomes (e), (g), and (h) may be assessed if they are relevant to the courses selected.
Attachment A

The University’s Baccalaureate Learning Goals can be summarized as follows.

A. **Competence in the Disciplines.** The ability to demonstrate the competencies and values in at least one major field of study. In addition, students are required to demonstrate informed understandings of other fields, drawing on the knowledge and skills of disciplines outside the major.

B. **Analysis and Problem Solving.** The ability to identify and diagnose problems; organize and critically evaluate relevant information of a qualitative and quantitative nature; develop reasonable arguments and effective solutions.

C. **Communication.** The ability to read, write, speak, and listen effectively. The ability to respond, with understanding and appreciation, to a wide variety of communicative acts.

D. **Information Competence.** The ability to make effective and ethical use of information resources and technology for personal and professional needs.

E. **Cultural Legacies.** Acquisition of knowledge of human accomplishments in the creative and performing arts and the achievements of human thought.

F. **Values and Pluralism.** The ability to apply ethical standards in order to make moral judgments with respect to individual conduct and citizenship, and to recognize the diversity of human experiences and cultures, both within the United States and internationally. The development of positive social attitudes, values, and behaviors.

With the exception of the learning goal E Cultural Legacies which is satisfied by University general education requirements, our program educational objectives are in alignment with the learning goals of the University’s mission, as demonstrated in the matrix below.

**Alignment of Program Educational Objectives with University Mission**

<table>
<thead>
<tr>
<th>Computer Science Program Objectives</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>X</td>
<td>X</td>
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<td>X</td>
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<td>X</td>
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<tr>
<td>3</td>
<td>X</td>
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<td>X</td>
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</tbody>
</table>

**Program Objectives**

Graduates of the program will
1. Demonstrate proficiency in the design, development, maintenance, and support of computing systems.
2. Be an effective and contributing member of project teams.
3. Engage in the pursuit of professional development opportunities and/or pursue graduate studies.
4. Assume a leadership role in their chosen career and profession.
5. Write effectively.
6. Have effective oral communication skills.
7. Abide by the ethical standards of the profession and understand the ethical, social, and global implications of their professional activities.
## Attachment B

### Mapping of Learning Outcomes to Program Objectives

<table>
<thead>
<tr>
<th>Program Objectives</th>
<th>Learning Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(a)</td>
</tr>
<tr>
<td>1</td>
<td>X</td>
</tr>
<tr>
<td>2</td>
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<tr>
<td>6</td>
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<td>7</td>
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</tbody>
</table>

### Program Objectives

Graduates of the program will
1. Demonstrate proficiency in the design, development, maintenance, and support of computing systems.
2. Be an effective and contributing member of project teams.
3. Engage in the pursuit of professional development opportunities and/or pursue graduate studies.
4. Assume a leadership role in their chosen career and profession.
5. Write effectively.
6. Have effective oral communication skills.
7. Abide by the ethical standards of the profession and understand the ethical, social, and global implications of their professional activities.

### Learning Outcomes (Abbreviated Descriptions)

- (a) Application of knowledge
- (b) Computer system development cycle
- (c) Application of software development principles
- (d) Skills and techniques for computing practice
- (e) Team work
- (f) Professional and ethical issues and responsibilities
- (g) Written communication
- (h) Oral communication
- (i) Life-long learning
# Attachment C

## Mapping of Core Courses to Learning Outcomes

<table>
<thead>
<tr>
<th>Learning Outcomes (CAC Outcome)</th>
<th>15</th>
<th>20</th>
<th>28</th>
<th>35</th>
<th>60</th>
<th>130</th>
<th>131</th>
<th>132</th>
<th>133</th>
<th>134</th>
<th>136</th>
<th>137</th>
<th>138</th>
<th>139</th>
<th>190 191</th>
<th>194-199</th>
<th>Phil 103</th>
</tr>
</thead>
<tbody>
<tr>
<td>a (a, j)</td>
<td>B</td>
<td>B</td>
<td>B</td>
<td>B</td>
<td>B</td>
<td>T</td>
<td>B</td>
<td>B</td>
<td>T</td>
<td>T</td>
<td>B</td>
<td>T</td>
<td>B</td>
<td>T</td>
<td>B</td>
<td>B</td>
<td>T</td>
</tr>
<tr>
<td>b (b, c)</td>
<td>B</td>
<td>B</td>
<td>B</td>
<td>B</td>
<td>B</td>
<td>T</td>
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<tr>
<td>c (k)</td>
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<td>B</td>
<td>B</td>
<td>B</td>
<td>T</td>
<td>B</td>
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<tr>
<td>d (i)</td>
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</tr>
</tbody>
</table>

B: Basic Knowledge  
T: Thorough Knowledge.

### Learning Outcomes (Abbreviated Descriptions)

- (a) Application of knowledge  
- (b) Computer system development cycle  
- (c) Application of software development principles  
- (d) Skills and techniques for computing practice  
- (e) Team work  
- (f) Professional and ethical issues and responsibilities  
- (g) Written communication  
- (h) Oral communication  
- (i) Life-long learning
Attachment D

Northrop Grumman Alumni Meeting with
Department of Computer Science
California State University, Sacramento

May 21, 2009
Northrop Grumman site, North Highlands, CA
10 a.m.-1:00 p.m.

Alumni of Sac State Present from Northrop Grumman:
Elaine Butler ('81), Greg Cantrell ('04), Nathan Eden ('08), Michael Daniels ('08), Steven Kodani ('08), Ryan Lamb ('08), Tim Mejdrich ('08), Bhaves Patel ('09), Tim Sturges ('07), Steven West ('07)

Present from California State University, Sacramento:
Bob Buckley, Mary Jane Lee, Meiliu Lu, Linda Nazzal, Anne-Louise Radimsky, Du Zhang

Tour
Cal State personnel were treated to a tour of several rooms where software simulations are being conducted on GGB BCT Notional Connectivity.

Meeting
Sac State’s recently hired alumni gave short introductory statements:

Elaine Butler (‘81, ‘88(MS)), Senior Software Engineer, was at NGC—tech management 2004, retired 2007, returned to do recruiting 2008.
Greg Cantrell (‘04), Software Engineer. He worked at Brown & Caldwell for four years and started at NGC one year and three months ago.
Michael Daniels (‘08), Software Engineer, has worked on the Cal State campus in IRT, at Old Republic Title, and now at NGC.
Nathan Eden (‘08), Software Engineer, worked at HP as an intern and contractor, and has been at NGC for four weeks.
Steven Kodani (‘08), Software Engineer. He has worked at NGC for two months, and this is his first job since graduation.
Ryan Lamb (‘08) Software Engineer. He interned at IGS, and has been at NGC since November.
Tim Mejdrich (‘08), Software Engineer, and this is his first job since graduation.
Bhaves Patel (‘09), Software Engineer. He has had five or six jobs including internships at Intel, he will graduate next week and is new to NGC.
Tim Sturges (‘07), General Engineer. This is his his first tech job since graduation. He spent his first year and a half as a Software Engineer and is now a General Engineer.
Steven West (‘07) Software Engineer, he interned at NGC for six months prior to graduation. He has worked on 4-5 projects here. He also owned his own business in web design and database application programs for ten years.

The faculty asked a series of seven questions.

1. Do you feel you are able to function effectively as a member of a team to accomplish a common goal? Please give examples of your team involvement since graduation. Please describe any CSUS learning experiences that contributed to your success in this area? Mary Jane asked that the focus be on four areas, cooperation/collaboration, communication, facing conflict and equal contribution.

Tim M – Yes, he can function effectively and part of his success is due to the senior project and CSC131. He gets clarification from his own team and also collaborates with other teams. He continues to learn on the job how important communication is, by making mistakes, re-evaluating and correcting. The first three focus areas are critical and the fourth is difficult because of the many personality types.
Bhaves – Prior work experience and the senior project have both helped. His current problem is that he is new and on a senior project team. He must decipher and learn the language of the job. Also, being on a large project presents a challenge in determining who to consult for specific questions. Generally, communication is not a problem.

Nathan – The senior project emulated real work experience. Interaction is constant and necessary to keep the project running smoothly. He was not prepared to work on a huge project with senior level personnel – this experience comes on the job.

Steven K – He would like to see more source controller configuration management. They use Clear Case at Northrop Grumman. Most projects are one to two years long with maintenance after the project. Elaine commented that an average project run is two to five years.

Tim S – Teams usually work with one to two other people and interface with other teams at meetings and to share subject matter expertise. The senior project, 137, 151 and 159 gave him experience in working with lab assignments. He suggests that we may think about assigning more large lab assignments.

Mike – He seconds the source control emphasis. How are things created and shared? He has had on the job experience in resolving conflicts. When he began there were two contractors on the team. One had coordination difficulties with how the project would be continued. He has since left. He notes that the experience on senior projects where some kept up better than others was helpful.

Greg – Long projects were helped by his Sac State experience, especially the senior project.

Ryan – They communicate as a team every day (he is on the agile development team). Learning about long lab projects was expanded on the job. It may be good to teach a large system at Sac State. New learning is acquired by going into an existing system and picking it apart. Also, everything is peer reviewed, so people must document.

Steven W – He started on legacy code maintenance and met weekly within his own group. At that point, he did not interact much. Since then, he has been placed on an r & d team that was handed a rough design. There is daily collaboration with the group. Could skills on how to interact outside of your group be taught? He is now on an integration team and gets many teams to work together. This has left him a bit out of his comfort zone.

2. Have you encountered ethical, legal, social or security issues in your career? In what way do you feel your CSUS education prepared you to have an understanding of these issues as they pertain to the development of software and systems?

Steve – At school, we helped each other but did not share. At work, classification prevents employees from accessing forbidden information.

Du asked if Philosophy 103 helped.

Steve – It did not help and needs and overhauling.

Nathan – Felt that his professor was actually unethical.

Tim – Had Professor Justin who he felt was good. He helped to distinguish perspectives on what is moral and not moral. He had no problems with the class.

3. How have you continued your professional development since graduation?

Tim - He attended an object-oriented design class at Northrop Grumman, and learned a lot on his own. He felt that configuration management and version control could be a target at Cal State since there is such a learning curve. Overall, he was prepared well at Cal State—he was taught how to learn.

There was consensus that the experience at Cal State taught students how to learn.
4. Have you found the need to learn things independently or on your own in order to perform your job? Give examples.

Steven – CS20 helped him most in terms of reverse engineering. Can it be restructured from C++ to Java? Also, at school many problems have only one right answer. Would it be good to offer a project where a fix/improvement/reverse engineering approach could be utilized to mimic real-world solutions that require creativity/rebuilds?

Nathan – The things he learned at work were mimicked at school in, for example, 130 and 137, where students were given a project and had to figure out a solution on their own. These are real world applications.

Mike – CSC 131 and the senior project helped him to learn how to pick up new information.

Steven – He has interviewed 30-40 people and finds that Sac State’s learning is more functional while others may have attended institutions that are more theory based. The functional approach helps employees to pick up a project and get to work much more quickly. Some theory can be useful to, for example, be aware of alternate applications. Overall, Northrop Grumman likes to hire employees that can get up and running fast, and these are the students who have been taught in a more functional atmosphere.

5. Since graduation have you received a graduate degree or are you pursuing a graduate degree? If so- in what field?

Greg – He has taken about a year’s worth of graduate courses, and is going for an MS. Northrop Grumman will pay for part of his tuition.
Steve W – He is considering it but hasn’t had time to pursue classes yet.
Mike – He is considering an MS in Computer Science.
Tim S – He will not pursue an MS degree just now.
Nathan – He plans to go back for an MS.
Bhavan – He plans to go back for an MS.
Tim M – He has no specific plans but has not ruled out an MS.

6. Have you been promoted or moved up in your career since graduation? Please elaborate.

Since it generally takes 3-5 years to be considered for a promotion, most of the alumni are a bit too new yet. Northrop Grumman didn’t hire for years, but they are stable now and hiring at a steady rate.

Elaine has been promoted several times. The first promotion was due to her attainment of a Master’s Degree. She suggests that the alumni keep their manager’s up-to-date on what they want to do and how they want to grow technically. Both the tech lead and functional manager will give input into evaluations, and employees will also choose peers to review them. At a certain point in one’s career, it is expected that he/she will move into a management position.

Generally, salary increases are performance-based and yearly. This year, the average is 3.5 to 3.8%.

7. What critical skills and knowledge do you think computer scientists will need for the future and what technologies do you see emerging or expanding?

Two NGC managers commented. Highlights of their comments are:

Critical skills teaching that would enhance a graduate’s success:

- Hardware Engineering
- Java
- A systems engineering slant to teaching. Experience in solving real-world problems.
- How to interface with “old world technologies”.
- Documentation in the real world.
• A number of applications including UML and their use in Modeling, XML, IDL, WSDL, RCP Eclipse.
• Networking protocols
• Web-based service design
• Configuration management theory.

8. Managers: How do our graduates compare with graduates from other universities? Strengths? Weaknesses?

Strengths

Both responding managers agree that Sac State graduates students who are able to implement their practical knowledge and get involved quickly. One of the managers and Elaine commented on how colleges other than Sac State might be teaching with a more theoretical focus.

Elaine Butler also spoke to the hirability of Cal State graduates for NGC. In the last year, 43 software engineers have been hired, and two-thirds were Sac State graduates.

The number one strength that Sac State graduates possess is the skills obtained in the senior project. Sac State students are at the top regarding practical skills and the senior project helps to pull them up to this. Elaine looks for transferrable experience, software development/life cycle experience, documentation in those she interviews.

Suggestions for Improvement.

Cal State could do more on the hardware side, and could offer more in terms of speaking in a conference room setting. Formal presentations are difficult and need more attention.

For Northrop Grumman, the teaching of software maintenance would be desirable (the real skill to analyze someone else’s code and re-engineer is probably done half time at NGC.

Testing and documentation.

Other suggestions for improvement from the room were

Could there be one big multi-disciplinary senior project with an emphasis on testing, with the professor as project manager? It would be more real-life to work on parts of a large project and put it all together. Du asked if a company could sponsor such an undertaking.

Could there be a course on software design?

The meeting adjourned at 1 p.m.
Notes by Linda Nazzal
attachment e

csc 190/191 survey

senior project survey - anonymous

answers will not effect your grade or the team’s grade. a summary of responses will be distributed to the class; no names will be used and the team name will not be used. this survey is intended to help you and your team analyze (and think about) how your team is working and also to help the senior project faculty better understand how the teams are working.

please check the response that is closest to your opinion and/or feelings about the question:

1. how would you – in general - describe the team’s level of cooperation and the collaboration amongst its members?
   - minimal – usually we each do our own thing.
   - average – we think we are operating at the level that is required.
   - above average
   - way above average – exceptional. members have gone beyond just the required technical reviews – at time we have worked in pairs and/or contributed in the review each other’s work

2. how well have team members worked together – in general – towards producing quality work in completion of each project phases (e.g. design, coding, documentation, etc.)?
   - not much. we have not really talked about this
   - we have talked about “quality” but i don’t feel we really know what specifically we should do.
   - most of us have revised our work because of quality concerns.
   - specific issues relating to quality are identified for most of the major work we do.

3. to what extent has the team talked about how to improve the team’s effectiveness – in general and/or in relation to specific work (this could include meetings, collaborative and/or individual work, etc.)?
   - i can’t say that we have talked very much about this
   - we did talk about this a few times but never had much follow through
   - we do talk about this quite a lot and occasionally have made some changes
   - we have made this a regular part of our meetings with the results being mostly positive

4. to what extent have members been kept informed about various aspects of the project’s work (this could include decisions, meetings, work assignments, requests from sponsor, faculty adviser and/or seminar adviser, contact with team members, etc.)?
   - communication has always been full, open and spontaneous – nothing held back.
   - there have been some lapses, but most of the time communication has always been full, open and spontaneous.
   - lapses occur, not all the time, but they are somewhat common.
   - communication has consistently been a big problem especially effecting critical aspects of the team’s work.
5. Assuming that you have had thoughts and unexpressed feelings and opinions about the project and the
effectiveness of the team, how have your felt about expressing these feelings and opinions?

- I felt completely free to express my feelings and opinions.
- Most of the time I felt free to express my feelings and opinions
- It depends on the situation - so at times I was reluctant to express my feelings and opinions
- My feeling was that we should just do the work and not bring up these kinds of issues – so I never felt free
to express my feelings and opinions

6. How does the team deal with alternative viewpoints presented by team members?

- Alternative viewpoints are never raised
- Most are disregarded or ignored
- A lot are listened to
- Most are given thought and consideration

7. How does the team – in general - deal with conflict and difference as well as violations of team “rules”?

- Avoids discussion of the conflict and the differences
- Recognizes the conflict and the differences but moves quickly on to other topics
- Faces the conflict and the differences but does not manage it well
- Faces the conflict and the differences openly and resolves the differences

8. To what extent do you feel that you are perceived by the other team members as an equal contributor and
participant in the project?

- Mostly as the major contributor and participant in the project.
- Mostly as an equal contributor and participant in the project.
- Sometimes, but mostly as a “part-time” contributor and participant in the project.
- Completely on the outside, not an equal contributor and participant in the project

9. How would you rate team “spirit”?

- Poor. There doesn’t seem to be much point in treating the project differently than other class assignments.
- It varies based upon the individual team member’s engagement.
- Sort of OK. We seem to get along really well and conversation doesn’t seem to be a problem.
- Great. The team enthusiastic and seem to care a lot about the project, the learning and producing a quality
product for our sponsor

10. At the moment, do you feel that you could work effectively with your team on another project?

- Not really
- Maybe, but only with some –not all – of my current team members
- Yes, if I had to
- An enthusiastic, Yes

Adapted from Using Student Teams in the Classroom,
Ruth Federman Stein and Sandra Hurd,
Midterm Essay Question

Write a roughly 3 page essay in which you do the following:
1. Briefly described a recent work-related situation that created a moral conflict for you.
2. Briefly describe how you resolved the conflict.
3. Briefly explain what moral principles, values, or considerations guided your decision regarding how to resolve the conflict.

Note: Your conflict may be a conflict between self-interest and a moral value or between two moral values. But you must (1) explain the conflict, (2) explain how you resolved the conflict, and (3) identify the considerations (moral values or non-moral interests) that influenced your decision. You may, but not need to, use either the Principle of Utility or Kantian Categorical Imperative as a consideration that led you to make the decision that you made.

Grading Rubric:

A = Does 1, 2, and 3 listed above.
B = Does 1, 2, but not 3.
C = Does 1, but not 2, 3
D = Fails to describe a moral conflict but discusses in some way moral issues.
F = Paper has no bearing on the question being asked.
Phil 103 Final Essay Question

Write a roughly 3 page essay in which you do the following:
1. Briefly described a conflict of values that you have experienced either on the job, at school, or at home.
   Be sure that you select a conflict between two different values, not a conflict between your self-interest and a value.
2. Briefly describe how you resolved the conflict of values.
3. Briefly explain what moral principles, values, or considerations guided or motivated your decision regarding how to resolve the conflict.

Note: Your conflict must be a conflict between two moral values, such as, a conflict between employer loyalty and the welfare of society or justice to employees. You must (1) explain the conflict, (2) explain how you resolved the conflict, and (3) identify the considerations, such as, moral value(s) that are most important to you or some of your non-moral interests, that influenced your decision. You may, but need not, use either the Principle of Utility or Kantian Categorical Imperative as a consideration that led you to make the decision that you made.

Grading Rubric:

A = Does 1, 2, and 3 listed above.
B = Does 1, 2, but not 3.
C = Does not describe a conflict between two values, but only a conflict between self-interest and a moral value, and does do 2, 3.
D = Fails to describe a moral conflict but discusses in some way moral issues.
F = Paper has no bearing on the question being asked.
<table>
<thead>
<tr>
<th>Criteria</th>
<th>1 Below Expectations</th>
<th>2 Progressing to Criteria</th>
<th>3 Meets Criteria</th>
<th>4 Exceeds Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Structure.</strong> This section evaluates the formal structure of the report including the organization of sections and subsections. Reports should have a title and a table of contents showing logical sections and subsections.</td>
<td>Organization unclear, inappropriate, or little evidence of organization or any sense of wholeness and completeness. No logical transitions.</td>
<td>Scope of the project is reasonably partitioned into areas which are addressed in separate sections. Within the sections, there may be some irrelevant or untimely information presented.</td>
<td>In addition to the preceding, within each section of the report, there is a reasonable flow of ideas. There is rarely a lack of focus. References to other areas of the report are made where appropriate.</td>
<td>In addition to the preceding, the reader has a sense of structure throughout the report. The report maintains a consistent style.</td>
</tr>
<tr>
<td><strong>Syntax, Sentence structure and conventions of standard English.</strong> This section evaluates the author's use of language to clearly communicate individual ideas. Spelling and grammar do play a part in this process and hence may be included in the evaluation. Syntax mainly concerns sentence structure and whether word order in the sentence correctly conveys the relationships that exist between concepts within the sentence.</td>
<td>Does not follow the rules of standard English. The reader is sometimes challenged to determine the intended meaning due to spelling and grammar errors. Syntax sometimes implies incorrect relationships, but the intent can still be discerned from the context.</td>
<td>Few spelling errors and less frequent grammar errors that the previous. Sentence structure usually conveys the correct relationships.</td>
<td>Rare spelling errors and only very subtle grammar errors. Words are chosen with care in consideration of fine differences in meaning. Misinterpretation is very unlikely.</td>
<td></td>
</tr>
<tr>
<td><strong>Paragraph Structure.</strong> This section evaluates the author's integration of sentences into meaningful paragraphs. Please evaluate the report with respect to the following description of a well-written paragraph: The first sentence of a paragraph establishes some perspective for the remainder of the paragraph (e.g., a topic sentence or a transitional sentence). Within a paragraph, sentences are relevant to the paragraph and are in a logical order. Near the end of the paragraph, there is some statement that unifies or completes the ideas presented in that paragraph.</td>
<td>Paragraphs are confusing, with unclear topic and meaning. Sentences within paragraphs seem to be related. Some paragraphs have a good structure.</td>
<td>Most of the paragraphs contain the elements described above, although there may be some loss of focus.</td>
<td>Paragraphs are on topic, understandable with few minor flaws. Stylistic variations show command of language.</td>
<td></td>
</tr>
<tr>
<td>Criteria</td>
<td>1 Below Expectations</td>
<td>2 Progressing to Criteria</td>
<td>3 Meets Criteria</td>
<td>4 Exceeds Criteria</td>
</tr>
<tr>
<td>--------------------------</td>
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</tr>
<tr>
<td><strong>Problem Statement</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unclear what the project is about.</td>
<td></td>
<td>General purpose of the hardware and/or software is described; functional description is simplified but related to purpose.</td>
<td>Purpose and function of hardware or software are described and related; conveys an understanding of the project and its value.</td>
<td>In addition to the preceding, function is well-described; describes nature of challenges; value of project clearly established.</td>
</tr>
<tr>
<td><strong>Design Requirements</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not clear what the design requirements or specifications are.</td>
<td></td>
<td>Various functions of the software and/or hardware are described; essential measures of performance are addressed but not necessarily quantified.</td>
<td>In addition to the preceding, fairly complete specifications are presented in an organized way showing appropriate numerical measures of performance or providing some means of assessing adequate performance.</td>
<td>In addition to the preceding, numerical specifications are reasonable and practical and not far in excess of what is needed; appropriate design constraints have been identified.</td>
</tr>
<tr>
<td><strong>Procedure (Design Process)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No clear indication of procedure to meet goals. Design decisions were made for no apparent reasons.</td>
<td></td>
<td>Some fundamental design choices were identified; some of the significant factors were considered; reasoning was plausible.</td>
<td>Key design decisions are identified as such; most of the significant factors were considered; alternatives are addressed.</td>
<td>In addition to the preceding, key design decision alternatives are compared; reasoning shows depth of understanding.</td>
</tr>
<tr>
<td><strong>Status of project (Data, results)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The status of the project is not clear.</td>
<td></td>
<td>Some aspects of the performance of the project are described with measured results or evaluative statements that tend to indicate its functionality at present. It may not be possible to conclude with certainty that the project works or that its deficiencies are clearly understood.</td>
<td>Most important aspects of the performance of the project are described with measured results or evaluative statements. The overall functionality is addressed adequately.</td>
<td>All important aspects of the performance of the project are described with measured results or precise evaluative statements. The appropriate measurements of overall functionality are presented; for non-functional parts, actual performance is compared to the expected performance.</td>
</tr>
<tr>
<td><strong>Conclusion</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No clear summary of project.</td>
<td></td>
<td>Conclusion mentions some accomplishments that were supported in the report. May be somewhat unclear or not put in the appropriate context.</td>
<td>Conclusion succinctly describes most accomplishments of the effort and relates them to the original problem statement.</td>
<td>All of the preceding plus: conclusion shows a deep understanding of subject area.</td>
</tr>
</tbody>
</table>
## Attachment H  Oral Communication Rubric

### ORAL COMMUNICATION RUBRIC

**Course**: __________________________
**Instructor**: _______________________
**Date**: ___________________________

**Team Name**: __________________________
**Evaluator**: Faculty [ ] Instructor [ ] Student [ ] Alumni [ ] Industry [ ]

### ORGANIZATION

<table>
<thead>
<tr>
<th>Ratings</th>
<th>Team as a Whole</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 – Exceeds Criteria</td>
<td>Some organization is attempted, but is generally lacking.</td>
</tr>
<tr>
<td>3 – Meets Criteria</td>
<td>Generally organizes content logically &amp; sequentially.</td>
</tr>
<tr>
<td>2 – Progressing to Criteria</td>
<td>Main points are missing.</td>
</tr>
<tr>
<td>1 – Below Expectations</td>
<td>Little evidence of organization.</td>
</tr>
</tbody>
</table>

- Organizes content logically and sequentially.
- Main points are clearly identified and concisely presented.
- Transitions are logical and smooth.
- Introduction, body, & conclusion are clearly delineated. Provides a clear summary of project.

### STYLE & DELIVERY

<table>
<thead>
<tr>
<th>Ratings</th>
<th>Individual Ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 – Exceeds Criteria</td>
<td>Essentially does not hold attention of audience.</td>
</tr>
<tr>
<td>3 – Meets Criteria</td>
<td>Generally passive &amp; occasionally attracts interest of audience.</td>
</tr>
<tr>
<td>2 – Progressing to Criteria</td>
<td>Most of the time, the voice is not clear or audible.</td>
</tr>
<tr>
<td>1 – Below Expectations</td>
<td>Does not communicate an interest in material being presented and shows lack of confidence.</td>
</tr>
</tbody>
</table>

- Attracts and holds interest of audience.
- Speaks clearly, distinctly, & with sufficient volume.
- Presents material effectively with confidence and enthusiasm.
- Maintains eye contact throughout presentation.
- Uses appropriate visual aids (e.g. audio, video, multi-media) that are clear, readable, and aid in better understanding of project.

**Student Names**: (a)__________________ (b)__________________ (c)__________________ (d)__________________ (e)__________________ (f)__________________
<table>
<thead>
<tr>
<th>LANGUAGE &amp; VOCABULARY</th>
<th>Individual Ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>4 – Exceeds Criteria</strong></td>
<td><strong>3 – Meets Criteria</strong></td>
</tr>
<tr>
<td>Appropriate use of vocabulary. Accurate use of technical terms and phrases.</td>
<td>Generally acceptable use of vocabulary and technical terms and phrases.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>APPEARANCE</th>
<th>Individual Ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>4 – Exceeds Criteria</strong></td>
<td><strong>3 – Meets Criteria</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COMMUNICATION OF TECHNICAL CONTENT</th>
<th>Ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>4 – Exceeds Criteria</strong></td>
<td><strong>3 – Meets Criteria</strong></td>
</tr>
<tr>
<td>Presents ideas &amp; arguments persuasively, logically, &amp; clearly. Solution is supported.</td>
<td>Arguments are clear, logical, and provide details to support solution.</td>
</tr>
<tr>
<td>Identifies related and existing applications. Techniques used are clearly stated and presented in the context of existing applications and solutions.</td>
<td>Provides some discussion of related work and application. Techniques used are stated.</td>
</tr>
<tr>
<td>Demonstrates a thorough knowledge of problem area.</td>
<td>Demonstrates a good understanding of problem area.</td>
</tr>
<tr>
<td>Answers all questions clearly and to the point.</td>
<td>Answers most questions.</td>
</tr>
</tbody>
</table>

After listening to the presentation, I understand:

- the project goals. □ Completely □ Mostly □ Somewhat □ Not at all
- the current status of the project. □ Completely □ Mostly □ Somewhat □ Not at all
- each student’s role in the project. □ Completely □ Mostly □ Somewhat □ Not at all