Please attach a narrative (not to exceed 4 pages, excluding appendices) addressing the following:

- What are the student learning outcomes? Please provide a numbered list.
- Which learning outcomes were assessed?
- How were they assessed? (Programs must use at least one direct assessment of student learning.)
- Undergraduate programs should assess at least one University Undergraduate Learning Outcome (UULO) each year, which may or may not overlap with a program learning outcome.
- Graduate programs should assess at least one outcome related to one of the following graduate level requirements each year:
  - student engagement in research, scholarship, creative expression and/or appropriate high-level professional practice.
  - activities requiring originality, critical analysis and expertise.
  - the development of extensive knowledge in the field under study.

- What was learned from the assessment results?
- How did the program respond to what was learned?

Please limit the narrative portion of your report to no more than four pages. You may attach appendices with data, tables, charts, or other materials as needed. Please explain the relevant conclusions from any appendices in your narrative. Please contact the Office of Academic Assessment if you have questions or need assistance.
Assessment Report

Program: BS in Computer Science

Submitted by

Department of Computer Science
University of Nevada, Las Vegas

December 2015
I. Introduction

Outcomes Assessed in 2015

Following 4 Outcomes (out of the 8 total outcomes) were assessed

- **Outcome A**: Analyze problems and identify the computing and/or mathematical techniques appropriate to their solutions.
- **Outcome B**: Apply design and development principles in the construction of software systems.
- **Outcome C**: Apply computer science theory and mathematical models to comprehend the tradeoffs involved in various design choices.
- **Outcome E**: Function effectively on a team to accomplish a common goal.

Both **Direct Assessment** and **Indirect Assessment** methods were used to assess the above outcomes

**Direct Assessment** was done by using either (i) *Selected Question Method*, or (ii) *Model Question Method*. Assessment questions in these methods were prepared by the instructors who taught the courses closely related to the corresponding outcomes. These assessment exams were scheduled at the end of the semester. For either method chosen by the instructor, the answers given by the students were organized in a rubric-categorized table. In this table, performance of student’s answers are grouped into four categories: (i) *Unsatisfactory*, (ii) *Below Expectation*, (iii) *Satisfactory*, and (iv) *Exceeds Expectation*. The tabulated responses are evaluated by the instructor to prepare semester-end assessment pages for each course. Results of the direct assessments for each outcome are summarized in a table. A threshold of 70% of students scoring satisfactory or more was set by the Assessment Committee as successful achievement of the outcome.

**Indirect Assessment** was done by using the instrument:

- Semester-end evaluations of outcomes by students taking the course.
  The responses were grouped into four categories: (i) Excellent, (ii) Good, (iii) Neutral, (iv) Fair, and (v) Poor. A median score of Good or better is considered achieving satisfactory outcome.
II. Assessment Results

Direct Assessment of Outcome A

Courses used to cover Outcome A:

- CS 135: Computer Science I (Fall 2014, Spring 2015)
- CS 456: Automata Theory (Fall 2014)

Direct Assessment examinations were given by instructors of CS 135, and CS 456 to cover Outcome A on the final week of the semester.

Tabulated results of direct assessment (Percentage Distribution) are as shown in the following table:

<table>
<thead>
<tr>
<th>Outcome A</th>
<th>Unsatisfactory (U)</th>
<th>Below Expectation (BE)</th>
<th>Satisfactory (S)</th>
<th>Exceeds Expectation (EE)</th>
<th>Remark for S+EE (Is it &gt;= 70% Threshold?)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 2014</td>
<td>0</td>
<td>22.5</td>
<td>67.5</td>
<td>10</td>
<td>77.5 (&gt; 70) Meets Threshold</td>
</tr>
<tr>
<td>Spring 2015</td>
<td>3.85</td>
<td>8.51</td>
<td>51.01</td>
<td>36.62</td>
<td>87.63 (&gt;70) Meets Threshold</td>
</tr>
</tbody>
</table>

- Overall Results for Outcome A: In Fall, the targeted threshold of 70% was achieved. In Spring 2015, the result is even better. Achievement level is fine.
- Notable suggested improvement(s) by instructor(s) and/or Assessment Committee members:
  - **Hands-on programming sessions:** A significant number of students seem to have difficulty in properly debugging and testing programs. Students of CS 135 should be assigned many more programming exercises with supervision of teaching assistants and/or lab monitors having prior experience in UNIX and debugging methods.
  - **Enforcing Prerequisite:** The Assessment Committee recommended the need to close the loopholes in prerequisite enforcement to weed out students without the correct background.

Direct Assessment of Outcome B:

Courses used to cover Outcome B:

- CS 135: Computer Science I (Fall 2014, Spring 2015)
- CS 202: Computer Science II (Fall 2014, Spring 2015)
- CS 472: Software Engineering (Fall 2014, Spring 2015)

Direct Assessment examinations were given by instructors of CS 135, CS 202 and CS 472 to cover Outcome B on the final week of the semester.
Tabulated results of direct assessment (Percentage Distribution) are as shown in the following table:

<table>
<thead>
<tr>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
</tr>
<tr>
<td>Unsatisfactory</td>
</tr>
<tr>
<td>Fall 2014</td>
</tr>
<tr>
<td>Spring 2015</td>
</tr>
</tbody>
</table>

- Overall Results for Outcome B: For both semesters, the targeted achievement level is satisfied.
- Notable suggested improvement(s) by instructor(s) and Assessment Committee
  - **Assign programming exercise in incremental order of difficulty**: Rather than assigning a few large size programming projects it may be pedagogically beneficial to break them into more smaller size programs. Students tend to complete smaller size programs on time with fewer errors.
  - **Test Data**: Students of CS 135 should be encouraged to generate a variety of test data for validating the correct working of programs.
  - **More in-class exercises**: More in-class exercises would be helpful to students.

**Direct Assessment of Outcome C**:  
Courses used to cover Outcome C:  
- CS 302: Data Structures (Fall 2014, Spring 2015)  
- CS 477: Analysis of Algorithms (Fall 2014, Spring 2015)  
Direct Assessment examinations were given by instructors of CS 302 and CS 477 to cover Outcome C on the final week of the semester.

Tabulated results of direct assessment (Percentage Distribution) are as shown in the following table:

<table>
<thead>
<tr>
<th>Outcome C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unsatisfactory</td>
</tr>
<tr>
<td>Fall 2014</td>
</tr>
<tr>
<td>Spring 2015</td>
</tr>
</tbody>
</table>
• **Overall Results for Outcome C**: In Fall 2014 the targeted threshold of 70% was not achieved. However, in Spring 2015, the targeted threshold was met. We can thus conclude that overall average result for Outcome C is barely satisfied.

• **Notable suggested improvement(s) by instructor(s) and Assessment Committee**
  
  o Some students did not perform well in analyzing the resource needs of algorithms. It may be necessary to put more emphasis on the asymptotic analysis of algorithms.

  o Quite a few students did not understand the difference between minimum spanning tree and shortest path tree. These topics should be covered in more detail next time CS 302 is offered.

**Direct Assessment of Outcome E:**

Courses used to cover Outcome E:

- CS 472: Software Product Design I (Fall 2014, Spring 2015)

Instrument used for making Direct Assessment:

- Final projects designed by student teams. These projects were presented by team members to audiences consisting of faculty members, students, and industry representatives. Group presentations were evaluated as direct assessment of Outcome E.

Tabulated results of direct assessment (Percentage Distribution) are as shown in the following table:

<table>
<thead>
<tr>
<th>Outcome E</th>
<th>Unsatisfactory (U)</th>
<th>Below Expectation (BE)</th>
<th>Satisfactory (S)</th>
<th>Exceeds Expectation (EE)</th>
<th>Remark for S+EE (Is it &gt;= 70% Threshold?)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 2014</td>
<td>5.88</td>
<td>11.76</td>
<td>26.48</td>
<td>55.88</td>
<td>82.36 (&gt; 70%)</td>
</tr>
<tr>
<td>Spring 2015</td>
<td>5.71</td>
<td>28.57</td>
<td>34.29</td>
<td>31.43</td>
<td>65.72 (&lt;70%)</td>
</tr>
</tbody>
</table>

• **Overall Results for Outcome E**: Result for Spring 2015 is below passing level, but if we take the average of both semesters then at least 73% of students performed satisfactory or better. Thus the performance of Outcome E for the last two semesters is fine.

• **Notable suggested improvement(s) by instructor(s) and Assessment Committee**

  o During the presentation of project design, each team was evaluated as one unit. In future semesters, it may be better to include peer evaluation of team members.
Indirect Assessment for Outcomes A, B, C, and E

- Courses evaluated by students for Outcome A: CS 135, CS 456
- Courses evaluated by students for Outcome B: CS 135, CS 202, CS 460
- Courses evaluated by students for Outcome C: CS 303, CS 472, CS 477
- Courses evaluated by students for Outcome E: CS 472

Questionnaires for evaluating outcomes covered by the courses were distributed in the class at the end of the semester by an administrative member arranged by Dean Office / CS Office. Responses to these questions were collected and analyzed to access the outcomes. Outcome wise results are as follows.

Conclusion: For the above 4 outcomes, measured indirectly, the median achievement level is good (G) or better. This means achievement levels for Outcomes A, B, C, and E, as measured indirectly, is satisfactory.

Assessment Result for University Undergraduate Learning Objectives (UULO’s)

The milestone course for BS degree program is CS 302. Outcome C overlaps with UULO’s objectives which are (i) ability to identify alternative data structures for implementation of algorithms, and (ii) ability to implement at least one major container type data structure to solve applied problems. The direct assessment of Outcome C for CS 302 shows that 97.1% of students achieved satisfactory or better. Thus almost all students achieved UULO’s at excellent level.
III. Plan for Next Assessment Period  
(Fall 2015 and Spring 2016)

- Make assessment of Outcomes D, F, G, H by using both direct and indirect methods.
- Analyze assessed data to obtain key findings.
- Follow-up on the suggestions for improving outcomes as recommended in this assessment period