MISSION STATEMENT
The Computer Science Department at University of Montana-Missoula dedicates itself and its resources to the growing utility of computers in research and education, as well as the increased impact of computers on our modern society. Our primary mission is to offer degrees (major, minor, graduate) for students who want to pursue a career in this discipline. Primary objectives of our curriculum include: 1) develop professionally competent and broadly educated computer scientists who wish to pursue professional careers or graduate studies, 2) mentor students and provide them with opportunities to engage in CS research, and 3) teach students how to think computationally and engage in problem solving and critical analysis.

DEPARTMENT ALIGNMENT WITH ACCREDITATION CORE THEMES
After listing each departmental objective, indicate which of the five core themes proposed in the Year One Self-Evaluation Report submitted March 1, 2018 to the Northwest Commission on Colleges and Universities the objective supports.

In this section, you may also briefly describe any innovative or noteworthy programs/initiatives that support the core themes.

1. Graduates will be able to apply the principles of computer science to solve various computer science related problems in their careers or further studies. Core themes 2, 4, and 5.
2. Graduates will be able to perform successfully in multi-disciplinary computing work or graduate school environments. Core themes 1, 4, and 3.
3. Graduates will demonstrate and be able to apply an understanding of social and ethical responsibilities as computer science professionals. Core themes 3 and 4.
4. Graduates will be able to communicate effectively within the various communities they work. Core theme 1 and 3.
### STUDENT LEARNING GOALS and MEASUREMENT TOOLS

<table>
<thead>
<tr>
<th>Student Learning Goals</th>
<th>In-class Assignments, Exams, &amp; Presentations</th>
<th>Capstone Class</th>
<th>Exit Survey</th>
<th>Advisory Board</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Analyze a complex computing problem and apply principles of computing and other relevant disciplines to identify solutions.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program’s discipline.</td>
<td>X</td>
<td>X</td>
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<td>X</td>
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<td>3. Communicate effectively in a variety of professional contexts.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>5. Function effectively as a member or leader of a team engaged in activities appropriate to the program’s discipline.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>6. Apply computer science theory and software development fundamentals to produce computing-based solutions.</td>
<td>X</td>
<td>X</td>
<td>X</td>
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</tbody>
</table>

### RESULTS and MODIFICATIONS

<table>
<thead>
<tr>
<th>Learning Goal results</th>
<th>Modifications made to enhance learning</th>
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</table>
| CSCI 136 – Learning Goal # 1  
Homework 1 and Lab 1 addressed this outcome. Successful students were able to integrate the proper operators and operands to fulfill the requirements. Those who were unsuccessful, used the wrong operators and were unable to solve the problems presented or the ones they created themselves.  
Homework 1 – 92.8%  
Lab 1 – 98% | Review of operators in class to reinforce any concepts that were missed. |
<table>
<thead>
<tr>
<th>CSCI 136 – Learning Goal # 2</th>
<th>Clarified learning goal objectives with concrete examples to aid in understanding what is was expected of the student.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments 1-5 addressed this outcome in increasing difficulty. Assignments were based on a number of learning goals. The assignments increased in difficulty and the student determined what to implement based on those objectives. Successful students were able to implement the program requirements. Unsuccessful students were unable to fully implement the program requirements. Homework 1-5 – 92.6%</td>
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<tr>
<td>CSCI 136 – Learning Goal # 3</td>
<td>Additional resources on UML diagramming were provided along with in class examples and handouts.</td>
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<tr>
<td>Assignments 2-5 as well as Labs 2-9, asked student start designing their solutions before implementing. Successful students were able to implement their UML and flow chart design. Unsuccessful student were unable to create a design of the requirements and then implement a solution</td>
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<tr>
<td>Homework 2-5 - 92.5%</td>
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<tr>
<td>Lab 2-9 – 89%</td>
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<tr>
<td>CSCI 136 – Learning Goal # 4</td>
<td>Continued working with the students individually to ensure they had a better understanding of how to keep their code in sync with one another.</td>
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<tr>
<td>Labs 1-8 required students to work in pairs or groups to create solutions to their labs. Successful students were able to work in teams and either work in a pair programming environment or in a distributed pair programming environment along with source code control. Unsuccessful student who worked in pairs/groups were unable to fully implement a solution together or keep their solution in a source control system</td>
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<tr>
<td>Lab 1-8 – 89.2%</td>
<td></td>
</tr>
<tr>
<td>CSCI 136 – Learning Goal # 5</td>
<td>Provided more examples from outside of class and how to use them. Worked through these examples during lab and class time to ensure all students were learning the process.</td>
</tr>
<tr>
<td>Homework 5 and Lab 8 gave students insight on how they needed to ensure that the solutions they implemented were robust and extensible. Successful students able to articulate the need to make changes or recognize how to change their projects based on new information learned from other resources outside of class. Unsuccessful students were unable to learn from outside resources to enhance and update their programs.</td>
<td></td>
</tr>
<tr>
<td>Homework 5 – 91%</td>
<td></td>
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<tr>
<td>Lab 8 – 84.6%</td>
<td></td>
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</tbody>
</table>
CSCI 136 – Learning Goal # 6
Homework 1-5 and Labs 1-8 asked students to use current enterprise IDE’s and evaluate best practices when implementing their programs. Successful students were able to not only implement a single solution to their programs but were able to look for alternatives that follow best practices. Unsuccessful students were able to use what was presented in class or in the book, but were unable to explore and expand their programmatic techniques.

Homework 1-5 – 92.6%
Lab 1-8 89.2%

Provided more examples of how to expand programs that may exist in the book and how to expand. Gave students more opportunities in class to work on expanding their skillset.

Programming Languages w C/C++ – Learning goal #1:
See Appendix A, CSCI 205 FCAR
See Appendix B, CSCI 205 FCAR

Capstone class – Learning goal #2:
See Appendix A, CSCI 426 FCAR
See Appendix B, CSCI 426 FCAR

Capstone class – Learning goal #3:
See Appendix A, CSCI 426 FCAR
See Appendix B, CSCI 426 FCAR

Capstone class – Learning goal #5:
See Appendix A, CSCI 426 FCAR
See Appendix B, CSCI 426 FCAR

FUTURE PLANS FOR CONTINUED ASSESSMENT

Looking forward to the 2019-2020 academic year, we see continued use of the advisory board as a high level tool for departmental assessment. In a more fine grained way, we will continue to use the faculty course evaluation reports (FCARs) to track our progress in individual classes. The exit survey, which is conducted as part of the capstone course is another important part of our assessment strategy. We will refine the questions asked in the Spring of 2019 so that we gain more information about the employment outcomes of our students. Finally, in course assessment in the form of exams and presentations is ongoing and prevalent across our curriculum.

APPENDICIES

1. Appendix A. CSCI 205 FCAR
2. Appendix B. CSCI 426 FCAR
APPENDIX A.
Faculty Course Assessment Report
Department of Computer Science
University of Montana

CSCI 205
Programming Languages w C/C++ (4 credits)
Spring 2018

Catalog Description: Concepts and principles of programming languages with an emphasis on C, C++, and object-oriented programming. Syntax and semantics of object-oriented languages. Principles and implementation of late binding, memory allocation and de-allocation, type-checking, scope, polymorphism, inheritance.

Prerequisites:
M 225

Income Assessment:
The students taking this course are mostly in their second or third year. Students are expected to have some programming experience.

Modifications made versus previous offering: none

Course Outcomes Assessment:
This course consisted of:

● 17 assignment with zyBooks. zyBooks is a web platform for learning STEM material. Our focus was on the C/C++ programming languages. zyBooks has minimal text. It consists of question sets, animations, interactive tools, and embedded homework, so students can learn by doing.
● 19 in class assignments
● 10 projects

The following course outcome was assessed:

Analyze a complex computing problem and to apply principles of computer and other relevant disciplines to identify solutions.

Most of the in class assignments and projects addressed the above outcome. Students were presented with a problem and expected to write a solution using C or C++. Below is a brief description of some of the problems:

● Several basic mathematic problems
● Yahtzee
● Program that simulates a shopping cart and items
● Program to store/update roster and rating information for a soccer team
● Program that reads in data and produces a visualization
● Program that outputs a menu of options to analyze/edit a string
● Stack
● Binary Tree
- Program that reads in the men’s NCAA bracket, runs it through an algorithm designed to produce the winning bracket, produces results to a file.
- Program that reads in the month and year from the user and produces the appropriate calendar
- Blackjack
- Program that compares the speed of linked lists and vectors

**Reflection:**

This offering of the course was close to the same as the previous semester with small changes. For the most part, I think students enjoyed this course. Students spent most of their time designing, implementing and testing solutions for given problems while learning the C and C++ programming languages. It was very much a hands on type of course.

**Proposed Changes:**

I think the basic structure of the course is good. I will keep searching for and creating better problems for the course. I would like to create an additional set of problems for students that would enjoy the extra challenge. This is a fun class to teach!

**Proposed Changes Requiring Approval of Undergraduate Studies Committee:**

none

**Grade Distribution:**

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>F</th>
<th>W</th>
<th>I</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>17</td>
<td>7</td>
<td>9</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>34</td>
</tr>
</tbody>
</table>
APPENDIX B.

Faculty Course Assessment Report

Department of Computer Science
University of Montana

CSCI 426
Advanced Programming I (Capstone Class)

Fall 2017

Student Learning Outcomes Assessment:

Clients were asked to provide feedback about the student teams they were working with and mentoring three times throughout the course of the semester. These evaluations were administered online via Qualtrics. The course outcomes assessment reported here are based on the final (3rd) client evaluations. This client feedback was deemed the best to use to evaluate student learning outcomes because they come at the end of the semester, after clients have had the longest period of time to work together with their student groups.

1. **Design**, implement, and **evaluate** a computing-based solution to meet a given set of computing requirements in the context of the program’s discipline.
   a. Students were asked to create a number of industry standard design deliverables for the project they worked on, including Team and Project Charters, an IEEE System Requirements Specification (SRS), User Requirements Specification, a Requirements Prioritization Matrix, and a Systems Modeling Specification. Many of these deliverable involved two versions, an initial version, which the instructor provided feedback on, and a final submission. Student teams were expected to share all deliverables with their clients for feedback and sign-off.

   As the grade distributions for the major deliverables of class shown in Table 1 illustrate, students performed very highly overall. In particular, with only a few exceptions, grades rose from initial versions (V1) of deliverables to the final versions.

<table>
<thead>
<tr>
<th>Group</th>
<th>Team Charter V1</th>
<th>Team Charter Final</th>
<th>Project Charter V1</th>
<th>Project Charter Final</th>
<th>SRS V1</th>
<th>SRS Final</th>
<th>User Reqs V1</th>
<th>User Reqs Final</th>
<th>Reqs Prioritization</th>
<th>Systems Modeling Final (out of 200 pts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVG</td>
<td>78%</td>
<td>98%</td>
<td>83%</td>
<td>98%</td>
<td>100%</td>
<td>99%</td>
<td>87%</td>
<td>89%</td>
<td>96%</td>
<td>91.5%</td>
</tr>
</tbody>
</table>

Table 1. Grade distributions for major class deliverables.

**Targeted thresholds:**
- 80% average grade or above on all deliverables.
- 85% (27/31) of all grades should increase from initial versions to final versions (where applicable).

**Actual thresholds:**
- Average grades for all deliverables was higher than 80% except Team Charter Version 1.
- 84% (26/31) of all grades do increase from initial versions to final versions (where applicable).

**Concerns and Discussion:**
- Average grades on Team Charter V1 should be higher. As this was the first deliverable submitted in the semester for the class, students may not have expected the level of scrutiny and high standards that all
their deliverables would be subject to. After this initial submission, the quality of deliverables rose and was consistently higher.

**Future Modifications:**

- None, beyond discussing high expectations for class and deliverables early in semester.

b. Client feedback on the quality of work the team is producing.

**Targeted threshold:** 2.7 on a scale of 3.0 (90%)

**Actual threshold:** 2.86 (95%)

**Concerns and Discussion:** None

**Future Modifications:** None

2. Communicate effectively in a variety of professional contexts.

a. Students were expected to communicate regularly with their clients via email throughout the semester. Client feedback on student group’s written email correspondences, reported from the last of three online surveys given to clients throughout the semester.

**Targeted threshold:** 2.7 on a scale of 3.0 (90%)

**Actual thresholds:** 2.89-3.0 (96-100%)

**Concerns and Discussion:** None

**Future Modifications:** None

b. Students were expected to develop clearly written, complete, and accurate deliverables throughout the semester and share them with their clients and the course instructor. Client feedback on the quality and usefulness of student’s written deliverables, reported from the last of three online surveys given to clients throughout the semester.

**Targeted threshold:** 2.7 on a scale of 3.0 (90%).

**Actual thresholds:** 2.6-3.0 (87-100%)

**Concerns and Discussion:** Three out of the six categories scored slightly lower than the targeted 2.7 level threshold, and thus warrant a closer look.

**Deliverables are:**

- Informative [2.625 score]
- useful to me [client] to communicate with others in my organization [2.6 score]
- useful to the development of our project software [2.625 score]

Upon closer examination of the aspects of student written deliverables that scored slight lower (bulleted above), the concern is deemed minimal because clients many not understand the value of more academically based deliverables. However, students should do a better job of keeping clients informed as to what the class expectations are, and how the deliverables are integral (and useful) to the entire software development process.
Future Modifications: Remind students earlier in class that clients may not necessarily understand and/or appreciate the expected class deliverables, and that part of their job is to educate and communicate with them about the deliverables and class expectations.

c. Students were expected to arrange and conduct regular face-to-face meetings with their clients throughout the semester. Client feedback on the team’s face-to-face communication with their clients, reported from the last of three online surveys given to clients throughout the semester.

Targeted threshold: 2.7 on a scale of 3.0 (90%).

Actual thresholds: 2.56-3.0 (85-100%)

Concerns: Three out of the thirteen categories scored slightly lower than the targeted 2.7 level threshold, and thus warrant a closer look.

During face-to-face meetings the team had:

- Clearly outlined meeting goals [2.67 score]
- taken turns with all members participating [2.56 score]
- listened well to my concerns [2.67 score]

Future Modifications: The students are not aware of the questions on the client surveys, and thus what exactly they are being evaluated on. Instructor will communicate these measures with students earlier in the course so they know the standards they are being held to and evaluated on.

d. Students conducted final project presentations during the last week of the semester publicly to the rest of the class, to clients, and to faculty members. Client feedback on the team’s face-to-face communication with their clients, reported from the last of three online surveys given to clients throughout the semester.

Targeted threshold: 2.7 on a scale of 3.0 (90%).

Actual thresholds: 2.5-3.0 (83-100%)

Concerns: Three out of the seven categories scored lower than the targeted 2.7 level threshold, and thus warrant a closer look:

Team’s showcase presentations:

- contained well-designed and appropriate slides [2.67 score]
- used the time well [2.5]
- was enjoyable to watch [2.67]

Future Modifications: Although we did spend some time in class discussing what makes for a good presentation, in the future the Instructor will ask groups to submit their slides to me ahead of time for feedback. As the Instructor looks through the content of planned slide presentations, he/she will also provide comments about how it appears the team will organize their talk and use their time. These changes will hopefully improve on the scores above.

3. Function effectively as a member or leader of a team engaged in activities appropriate to the program’s discipline.
   a. This course is entirely team based. With one or two exceptions, all teams stayed the same throughout the entire semester. Each team, which ranged from 3-6 students, had a team leader (project manager) assigned by the course instructor at the beginning of the semester. All team members submitted peer evaluations 4 times throughout the semester. Results of the final peer evaluation of the semester are shown below.
i. Student responses when asked to evaluate their **project manager** across a number of different issues, as shown in all responses were above an 85% threshold for the highest rating.

**Targeted threshold:** 85% or higher for all questions.

**Actual thresholds:** 85% or higher for all questions.

**Concerns:** None.

**Future Modifications:** None.

ii. Student responses when asked to evaluate their **team peers** across a number of different issues.

**Targeted threshold:** 85% or higher for all questions.

**Actual thresholds:** Aggregating is somewhat difficult because questions target different team members, but in general the actual thresholds were 85% or higher for all questions except possibly:

- Did fair share of work
- Communicated effectively with client
- Was on time and attended all meetings

**Concerns:** None. For teams of this size working together for a long period of time, the Instructor is quite satisfied with the peer evaluations. Part of the overall grade for the class includes Attendance and Class Engagement.

**Future Modifications:** None.