

## MISSION STATEMENT

The 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. This strongly implies that knowledge of computers and their capabilities should be a part of the basic education of all students. The Department of Computer Science then has a two-fold mission: 1) to provide appropriate non-major courses to meet the needs of all students, and 2) to offer a major and minor for those students who want to pursue a career in this discipline. The objective of the undergraduate major/minor curriculum in computer science is to develop professionally competent and broadly educated computer scientists who wish to pursue professional careers or graduate studies.

## STUDENT LEARNING GOALS

### 1. Student Learning Goals:

We have established the following program objectives and related outcomes. Objectives refer to what we want for our students 3-5 years after they graduate from our program, and outcomes refer to what we want for our students when they graduate. Note that some outcomes apply to multiple objectives.

**Objective 1:** Graduates will have an understanding of the principles of computer science and knowledge of the discipline.

**Outcome 1:** Students understand fundamental principles of the science and engineering of computation, including those of computer systems, of software design, and of algorithm analysis.

**Objective 2:** Graduates will have an understanding and appreciation of the context in which computing activities occur.

**Outcome 2:** Students demonstrate the ability to work effectively in teams and independently.

**Outcome 3:** Students have knowledge of range of applications and the interdisciplinary nature of computing science and technology.

**Objective 3:** Graduates will have an understanding of the social context of computing.

**Outcome 3:** Students have knowledge of range of applications and the interdisciplinary nature of computing science and technology.

**Outcome 4:** Students can identify, assess, and resolve social, professional and ethical issues related to cybertechnology.

**Objective 4:** Graduates will experience career success, including acceptance to and matriculation from graduate programs.

**Outcome 2:** Students demonstrate the ability to work effectively in teams and independently.

**Outcome 5:** Students can communicate effectively both orally and in writing.

**Outcome 6:** Students are well prepared for graduate study in Computer Science, and/or for leading technical positions in industry.

We will communicate the objectives and outcomes to both incoming and current students via advising material, our freshman seminar, and our departmental web site.

## MEASUREMENT OF GOALS

**We measure our student learning goals using the following assessment methods:**

**E-portfolios:** We will continue to rely on our e-portfolios to assess a number of our outcomes. To-date the projects included in these e-portfolios have been self-selected (i.e., the students choose what to showcase). The CS department will implement a process to ensure that a representative group of projects from all our core courses and beyond will be saved at the time they are completed. While some of the details of this process are still under development, faculty members from all related courses will make sure that at least one major project from the class gets saved. In addition, we have revised the rubric that faculty members will use to review and evaluate the e-portfolios so that it accurately reflects our newly drafted outcomes. The CS faculty will continue to complete these rubrics on an individual basis each semester when e-portfolios are completed, and will subsequently meet to discuss and determine our collective evaluation. Furthermore, we will involve our alumni, which represents a group of external reviewers, in the review of the e-portfolios.

**Alumni surveys:** The alumni surveys listed in our self-study were informal conversations with alumni. We will continue to ask for this type of feedback from alumni, and we will ask faculty to make notes on such conversations so that this feedback is documented. We will also begin a more formal alumni survey to assess all of our objectives, including the success of our former students in CS or IT related jobs or in graduate school 3-5 years after graduation. We will ask our former students for feedback on our program, specifically in terms of structure, content, and achievement of objectives. We have contact information on about 700 graduates from our University Foundation, and we will solicit volunteers to fill out the survey.

**External review of our capstone courses:** We will ask members of our external advisory board to provide review and guidance in our senior level capstone course sequence (CS 441/442). CS 441 covers software design, implementation, and testing. The course relies on many of our core courses. In CS 442, students work in teams to complete software development projects, and they write up documents and make presentations describing their projects. We will invite members from the advisory board to observe the final project presenta-

tions, and to examine the final reports that student teams submit. We will then gather feedback from the advisory board as to the quality of the work they are seeing from the students at this level, and whether or not it represents a sufficient level of knowledge and skill for our graduating CS seniors to prepare them to succeed per our objectives in CS and IT-related positions and for graduate school. We will experiment with videotaping or teleconferencing these presentations so that out-of-town advisory board members can participate in this evaluation.

**Graduate survey:** Our Career Services office conducts a graduate survey every year. The 2006 survey is available online at <http://www.umt.edu/career/gradsurvey/2006%20gradsurvey/2006GraduateSurvey.pdf>. For the graduates that respond, the survey shows whether the student is employed full time in a position related to their major, employed full time in a position not related to their major, employed part time, unemployed, or continuing their education. It also gives the average full time annual salary.

**How our objectives will be assessed:**

All of our objectives will be assessed by the Alumni Survey described above. Specific questions have been added to the survey to address our objectives.

Objective 4 will be also be assessed by the Graduate Survey. This is a direct assessment of this objective during the first year following graduation.

**How our outcomes will be assessed:**

1. Students understand fundamental principles of the science and engineering of computation, including those of computer systems, of software design, and of algorithm analysis.

**Assessed by:**

- E-portfolios, including external (alumni) review: As described above, we will require that students include projects from all core CS courses, not just self-selected ones. In addition, we have revised the rubric that faculty members currently use to review and evaluate the e-portfolios so that it accurately reflects our newly drafted outcomes. The CS faculty will continue completing these rubrics on an individual basis each semester when e-portfolios are completed, and will subsequently meet to discuss and determine our collective evaluation.
  - **External review of capstone course by members of our advisory board:** Our capstone course sequence (CS 441/442) brings together and tests many of the core areas of computer science at the senior level, making it an excellent candidate to use for this kind of review.
  - **Alumni surveys:** Questions 4, 5, 6, 7, and 8 of our alumni survey directly ask graduates whether this outcome was achieved.
  - **Advisory board:** As we have done in the past, we present an overview of our curriculum to our advisory board, and ask whether our curriculum is covering these topics. We also solicit feedback from our advisory board on our objectives and outcomes.
  - **Exit interviews:** Questions 3, 4, 5, 16, and 17 of our exit interview ask about this outcome.
  - **Student evaluations:** We use student evaluations to judge the effectiveness of courses that teach the topics mentioned in this outcome.
2. Students demonstrate the ability to work effectively in teams and independently.

**Assessed by:**

- **Exit interviews:** Question 7 of the exit questionnaire directly refers to this outcome.
  - **E-portfolios:** We will also examine the projects that students showcase in their e-portfolios to determine if the diversity of experiences that they encounter working both independently and in groups appear to be sufficient, and we will also ask the alumni that volunteer to review the e-portfolios to comment on this as well.
  - External review of capstone course: Since most of the projects that students complete as part of their capstone sequence are group projects, we will remind those external members from the advisory board who agree to review final project presentations and reports in this class to provide feedback on the apparent experiences that students engaged in both individually and as part of a group.
  - **Alumni surveys:** Question 9 of the alumni survey refers to this outcome.
3. Students have knowledge of the range of applications and the interdisciplinary nature of computing science and technology.

**Assessed by:**

- **Exit interviews:** Question 18 of the exit questionnaire directly refers to this outcome.
- **Alumni surveys:** The alumni survey includes a question (15) that addresses this outcome.
- **Advisory board:** We will continue to use feedback we receive from our annual advisory board meetings to help us gauge how well our curriculum is meeting the needs of employers.

4. Students can identify, assess, and resolve social, professional and ethical issues related to cybertechnology.

**Assessed by:**

- **Exit interviews:** The question 13 of the exit interview focuses on how knowledgeable and aware students feel they are in terms of social, professional and ethical issues related to computing. For our graduating seniors, these questions relate directly to CS 415E— our required course in Computer Ethics & Society—where the focus is on learning about ethical problems that computer scientists face, the codes of ethics of computing professional societies, and the social implications of computers, computing, and other digital technologies.
- **Alumni surveys:** We ask previous students (in questions 13 and 14) to reflect back on what they have learned as part of our program, and how well this prepared them for dealing with actual experiences they have encountered while working in industry.
- **Advisory board:** We ask our advisory board to discuss this issue with our students during our annual meeting, and to help us determine whether or not our students appear to be getting the necessary understanding.
- **Student evaluations:** We use student evaluations of our CS 415E course to judge the effectiveness of this course.

5. Students can communicate effectively both orally and in writing.

**Assessed by:**

- **External review of capstone course:** External review members recruited from our advisory board will help us assess oral presentations in our capstone course and others. Despite the relatively small size of our department, we are able to offer students a wide range of opportunities to write different types of documents. For example, in their senior capstone course, students are expected to produce final reports that contain descriptions of system requirements, flow diagrams, test cases and scripts. In the senior level Ethics course that is required for all graduating seniors (CS 415E), students are asked to write a variety of persuasive essays on current event topics having to do with ethics and cybertechnology. This range and diversity of writing experiences is intended to enhance the capabilities of our students, and the external review members will help us determine if we are being successful in training our graduates to a suitable level of proficiency.
- **E-portfolios:** E-portfolios are included in the assessment of this outcome because again, we will solicit external review of these portfolios from our alumni, and some of the projects that students will display as part of their portfolios will include written reports. This will constitute two different groups of external reviewers (i.e., members of our advisory board and alumni) that will look at students' writing and provide feedback on its quality.
- **Exit interviews:** The exit interview contains specific questions (8, 9, 10, 11, 12, 13) that address this outcome.
- **Alumni surveys:** The alumni survey includes questions (10, 11, 12) that address this outcome.

6. Students are well prepared for graduate study in Computer Science, and/or for leading technical positions in industry.

**Assessed by:**

- **Graduate Survey:** The Graduate Survey produced by Career Services directly assesses this outcome.
- **Alumni surveys:** The alumni survey includes questions (16, 17, 18, 19) that address this outcome.
- **Exit interviews:** Question 2 of the exit interview refers to this outcome.

## MODIFICATION

Our department has recently redefined our student outcomes and objectives, along with assessment measures for each, based on an ABET accreditation visit in the fall of 2007. As such, we have not yet fully utilized all the assessment measures described in the previous section. However, we have made a number of changes to our program as a result of past advisory board recommendations, student evaluations, and student performance.

**These changes include:**

1. We added CS 435 Web Programming to the curriculum. This course was first taught under a special topics number in 2001 and was added as an official course in 2004. This change was a direct result of an advisory board recommendation in 2000.
2. We incorporated the use of IDEs (integrated development environments) to facilitate programming. As a result of an advisory board recommendation in 2003, we are now using IDEs in several courses. CS 131 and 132 are using the JGRASP IDE. CS 241 is currently using Eclipse. CS 344, 346, 441, and 442 use Microsoft Visual Studio.
3. We have upgraded our laboratories. For example, in 2002 we added a graphics and visualization laboratory, and in 2007 we upgraded our Windows Lab to a Macintosh/Windows lab. These upgrades were partly in response to student evaluations.
4. We offered a course in Software Quality Assurance in 2006. This was partly in response to a 2003 advisory board recommendation.
5. We have continued to bring in technology leaders and practitioners to talk to students. This is in response to a 2003 advisory board recommendation.
6. We converted CS 241 Data Structures and CS 242 Programming Languages to laboratory courses. These changes were partly a result of our evaluation of student performance in the previous versions of these courses.

In the future, we will have at least one departmental meeting per year that formally considers our assessment results. Before this meeting, the Chair, with the assistance of our administrative associates, will prepare summaries of our assessment results. Minutes will be taken at this meeting to document both the discussion and the decisions made.