

**Building a Computer Science
B.S. Degree Program
Online for Post-Baccalaureate Students**

Planning Process



Building a Computer Science Online Degree Program

Planning



Idea to Action



Terri Fiez talks about the inspiration for creating computer science online degree program ([see video](#)).

Motivation

- **EMPLOYMENT OPPORTUNITIES ABUNDANT:** Nation's first post-bacc CS program targeted to realigning college graduates to jobs
- **ECONOMICAL & TIME EFFICIENT:** Bachelor's degree in CS can be completed in one, two, or three years
- **ACTIVE LEARNING INSTRUCTION:** Courses delivered using best known methods for on-line instruction to ensure effective learning
- **RELEVANCE, INNOVATION, AND COLLABORATION:** Key experiences and instruction reinforce professional skills and preparation
- **ADVANCES OSU'S REPUTATION:** Highlights OSU's research impact, collaboration with industry, and innovative approaches to education
- **ADDRESSES CRITICAL NEED FOR OREGON AND NATION:** Program will double OSU's BS CS graduates ready for employment or graduate school

Motivation

Targeting an Untapped Market

Combining any Bachelor's degree with the B.S. in C.S. provides opportunities greater than the sum of each:

$$1 + 1 = 3$$

According to labor experts "hybrid careers" combining "computing with other fields will increasingly be the new American jobs of the future..."

Steve Lohr, New York Times, Dec. 20, 2009

OSU is Leading the Way for the Nation

"As more and more Oregonians seek education and advanced skills in the software and technology fields, e-coursework and online programs such as this create additional degree opportunities across our state, enhancing OSU's position as a leading provider of education in this field, and increasing the likelihood that Oregon students will be able to complete their studies and find employment here in our state."

Skip Newberry, the President of the Technology Association of Oregon

(continued)

Motivation

U.S. Unemployment High *Computing Employment Needs Unmet*

- 1 in 2 new college graduates are jobless or underemployed.¹
- 69% of executives of high tech companies across the country agreed there is a national shortage of tech talent. One-quarter said it is a “significant” shortage.²
- Computing jobs to grow 22%-30%.³
- Portland is sixth fastest growing city for technology jobs.⁴
- Average salaries for graduates with computer science degrees was \$64,800 in 2013.⁵

1 Associated Press, April 23, 2012

2 “Talent Shortage May Impede New Hiring by Technology Companies,” Technology Councils of North America, <https://www.dropbox.com/s/1d92kum09izirpi/11-12-2013-TECNA%20Survey%20-%20National%20PR-FINAL.pdf>

3 “Occupational Outlook Handbook, 2010-2020,” Bureau of Labor Statistics, U.S. Department of Labor www.bls.gov/ooh/about/projections-overview.htm.

4 “March 2012: Fastest-Growing Cities for Technology Jobs,” media.dice.com/report/fastest-growing-cities-technology-jobs/.

5 “NACE Salary Survey,” National Association of Colleges and Employers, http://www.naceweb.org/uploadedFiles/NACEWeb/Research/Salary_Survey/Reports/salary-survey-april-2013-executive-summary.pdf.

Motivation

Why BS CS versus MS CS?

- Targets students interested in hybrid careers
- For students with other undergraduate degrees, getting an M.S. CS would require taking most all of the classes in this program first
- The compressed curriculum (60 credits of computer science) allows students to quickly ramp up their programming skills, so that in as little as 12 months they can have a degree in CS.
- No program of this type is offered in the country at this point – there are full B.S. and full M.S. programs but no program targets this untapped market.
- Starting salaries for BS CS are well above most other occupations (\$60k-\$95k)

Motivation

CS/CE Degrees Nationally and Locally

Nationally

- 12,171 B.S. CS/CE graduates each year in U.S.¹
- 1,532 Ph.D. CS graduates in U.S.¹
- Nearly two-thirds (63 percent) of executives from tech companies across the nation reported they plan to hire in the next 12 months.²

Oregon

- 245 B.S. C.S. graduates across Oregon Univ. System (OUS)
- There has been no increase in OUS BS CS graduates in the last decade
- 80% of Oregon tech businesses plan to hire in the next 12 months.³
- Numerous companies have located in Oregon recently and/or have extensive needs for computing graduates at all levels (BS, MS, PhD)

1. Zweben, S. and Bizot, B. 2012 *Taulbee Survey*. Computing Research News, May 2013;

http://cra.org/uploads/documents/resources/crndocs/2012_taulbee_survey.pdf

2. "Talent Shortage May Impede New Hiring by Technology Companies," Technology Councils of North America, <https://www.dropbox.com/s/1d92kum09izirpi/11-12-2013-TECNA%20Survey%20-%20National%20PR-FINAL.pdf>

3. "Oregon Tech Survey Finds Universities, Talent Shortage are Biggest Concerns," The Oregonian, http://www.oregonlive.com/silicon-forest/index.ssf/2013/11/oregon_tech_survey_finds_unive.html

Getting Started

Define overall goals:

- Impact the job market in Oregon and the nation by educating students for jobs for software engineering jobs
- Provide quality education
- Start as soon as possible and evolve through the process, similar to a start-up company
- Instill core values of EECS by providing relevant, experiential learning

Delegate tasks:

- Coordinator of faculty who will develop courses
- Committee to share best practices in course development

Industry Support

EECS Industry Advisory Board (IAB): a group of 45 industry representatives that regularly meet with EECS leadership to provide guidance on programs and collaborations

- The IAB has been encouraging and supportive of the program throughout the process and advised decisions on curriculum.

Technology Association of Oregon: the largest professional technology association for Oregon and SW Washington.

- The TAO gave their support from the initial idea and participates in on-going career connections with students in the program.

Designing the Program

Goals: Provide a quality degree program targeting computer skills currently in demand. Structure a program that can be completed in a year.

Courses should prepare students for computer science positions or professions dealing with software engineering, mobile applications, and web development. To meet these needs the computer science curriculum committee developed three new courses.

New courses:

1. Discrete Structures in Computer Science (CS 225): Replaces a two-term discrete math sequence, focuses on math that has direct application to computer science.
2. Mobile and Cloud Software Development (CS 496): Focuses on software development for emerging technologies.
3. Web Development (CS 494): An accelerated introduction to web development that provides practical experiences such as work with database systems and active content.

Program Structure:

1. 60 credits of computer science courses.
2. The courses were arranged to ensure that prerequisites could be met and credits would be distributed across the quarters.
3. Every course offered every term

Unique Course Features



Relevance – Exposure and interaction with industry

Innovation – Unique projects that give students experience with creative problem definition and solutions



Collaboration – Peer interaction and collaboration on homework & projects

University Process



Paul Paulson discusses the process of getting approval from the University for the online degree program ([see video](#)).

University Process

OSU's Office of Academic Programs, Assessment, and Accreditation facilitates approval of new academic programs.

1. Starting in January 2012, we attempted a Category I Proposal
 - a) The proposal included an executive summary, the proposal form, a budget and external letters of support.
 - b) The proposal was sent out to liaisons for comments in campus units that could be affected by the program. Liaison comments and our committee's responses were included in the final proposal.
 - c) The review process for a Category I Proposal has 10 steps and goes all the way to the Oregon State Board of Higher Education
2. In February 2012 we switched to an Category I Abbreviated Proposal
 - a) Our program did not fit into an existing category, so it was decided an abbreviated proposal was more appropriate.
 - b) The proposal did not make it past the Faculty Senate Curriculum Council because of concerns on-line students would have an opportunity that on-campus students did not have (a second bachelor's degree), and that the degree was not equivalent to a regular CS degree (there were particular concerns about the math requirement).
3. Solution Found! Submitted at a Category II Proposal
 - a) Rather than make the Online degree program separate, we created a new option within the existing CS degree. The course plan was reworked to make the core courses consistent across the degree options.

Addressing University Concerns

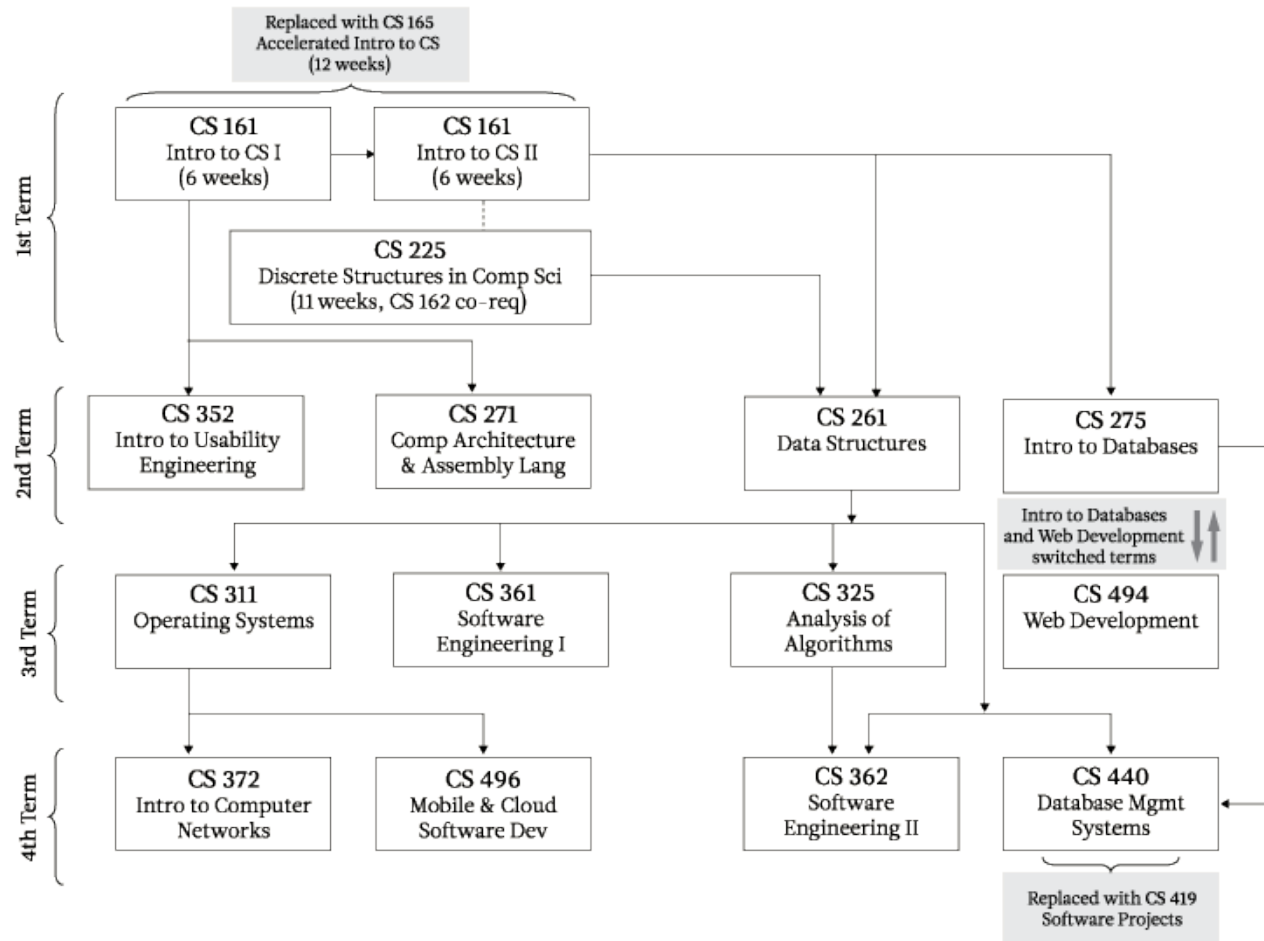
Goal: Modify the program to address the concerns of the University Curriculum Committee, making the new online degree program a computer science option, rather than a new degree program.

The stumbling block for the first proposal was that the committee felt the program was not fair to current on-campus students because they were not given the option of a double degree. The committee also asserted that all CS degrees from OSU should be equivalent.

1. The program was redefined to include on-campus students, who can take this program in parallel with another degree.
2. The courses were modified so that all CS degree options require the same core courses: Introduction to Computer Science I & II (CS 161, CS 162), Data Structures (CS 261), Introduction to Databases (CS 275), Operating Systems (CS 311), Analysis of Algorithms (CS 325), Software Engineering I & II (CS 361, CS 362), Introduction to Computer Networks (CS 372)

Approved Course Plan

later modifications indicated by grey boxes



Current Curriculum by Topic Area

Programming Fundamentals & Software Engineering

- Programming I, II (CS 161 & CS 162 OR CS 165)
- Discrete structures (CS 225)
- Data structures (CS 261)
- Analysis of algorithms (CS 325)
- Software engineering I, II (CS 361 & CS 362)

Computer Systems & Networking

- Computer architecture & assembly language (CS 271)
- Operating systems (CS 311)
- Introduction to computer networks (CS 372)

Databases

- Introduction to databases (CS 275)
- Software Projects (CS 419)

Usability

- Introduction to usability engineering (CS 352)

Mobile & Web Development

- Web development (CS 494)
- Mobile & cloud software development (CS 496)

- Course descriptions
- 1-year, 2-year, and 3-year track plans