April 17, 2009

Vice Chancellor Susan Jeffords
University of Washington, Bothell
Box 358522

Dear Susan:

Based upon the recommendations of the Executive Council on General Faculty Organization, the Faculty Council on Tri-Campus Policy has recommended approval of a Bachelor of Arts degree in Applied Computing. A copy of the proposal is attached.

I am writing to inform you that the Computing and Software Systems program is authorized to offer this option beginning autumn quarter 2007 and thereafter.

The new requirements should be incorporated in printed statements and in individual department websites as soon as possible. The *General Catalog* website will be updated accordingly by the Registrar's Office.

Sincerely yours,

Mark A. Emmert
President

Enclosure

cc: Ms. Dina Meske (with enclosure)
Mr. Robert Corbett (with enclosure)
Dr. Deborah H. Wiegand (with enclosure)
Todd Mildon, J.D. (with enclosure CSS-20070112)
Ms. Barbara Van Sant (with enclosure)

UNIVERSITY OF WASHINGTON
CREATING AND CHANGING UNDERGRADUATE ACADEMIC PROGRAMS

After college/school review, send a signed original and 8 copies to FCAS, Box 355850.

For information about when and how to use this form: http://depts.washington.edu/uwcr/1503instructions.pdf

College	Department or Unit	Date
Bothell	Computing and Software Systems	1/12/07

New Programs

- ☐ Leading to a Bachelor of_____ in _____ degree.
- ☑ Leading to a Bachelor of _Arts_____ degree with a major in _Applied Computing_____.
- ☐ Leading to a _____ Option within the existing major in _____.
- ☐ Leading to a minor in _____.

Changes to Existing Programs

- ☐ New Admission Requirements for the Major in _____ within the Bachelor of _____.
- ☐ Revised Admission Requirements for the Major in _____ within the Bachelor of _____.
- ☐ Revised Program Requirements for the Major in _____ within the Bachelor of _____.
- ☐ Revised Requirements for the Option in _____ within the major in _____.
- ☐ Revised Requirements for the Minor in _____.

Other Changes

- ☐ Change name of program from _____ to _____.
- ☐ New or Revised Continuation Policy for _____.
- ☐ Eliminate program in _____.

Proposed Effective Date:

Quarter: ☑ Autumn ☐ Winter ☐ Spring ☐ Summer **Year: 20** 07

Contact Person	Contact's Phone	Contact's Email
Charles Jackels	425 — 352 — 5368	jackels@u.washington.edu

EXPLANATION OF AND RATIONALE FOR PROPOSED CHANGE

For new programs, please include any relevant supporting documentation such as student learning outcomes, projected enrollments, letters of support and departmental handouts. *(Use additional pages if necessary).*

Attached is the degree proposal which includes:
Learning outcomes on pages 27 & 28
Projected enrollments on page 29
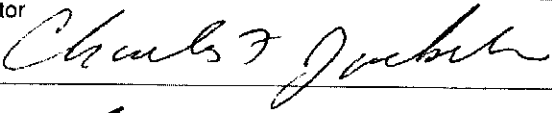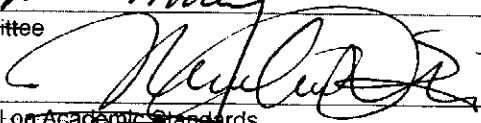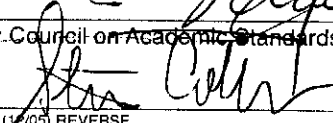Letters of support are on page 49

PROPOSED CATALOG COPY

Reflecting requested changes (Include exact wording as you wish it to be shown in the printed catalog. Please underline or otherwise highlight any additions. If needed, attach a separate, expanded version of the changes that might appear in department publications)

The Bachelor of Arts in Applied Computing focuses on the application of computer technology to non-computing fields. Students in the Applied Computing degree get a broad view of computing by taking a common core of classes that concentrate on computing, software engineering, management, communications, and knowledge of hardware and operation systems. The elective courses serve to create a unique hybrid degree in computing and another field of study that allows students to concentrate on an application domain.

SIGNATURES (required)

	Date
Chair/Program Director	1/12/07
Dean	1/16/07
College Committee	3/5/07
Faculty Council on Academic Standards	1/16/07

RESET FORM

Application to the
Higher Education Coordinating Board
for a New Degree

Bachelor of Arts
in
Applied Computing

University of Washington Bothell

December 1, 2006

FORM 2

<h1 style="text-align:center">COVER SHEET
NEW DEGREE PROGRAM PROPOSAL</h1>

PROGRAM INFORMATION
Program Name: Applied Computing

Institution Name: University of Washington, Bothell

Degree Granting Unit: University of Washington, Bothell

Degree: BA   **Level:** Bachelor   **Type:** Arts

Major: Computing and Software Systems   **CIP Code:** 11

Minor: NA

Concentration(s): None

Proposed Start Date: Autumn Quarter, 2007

Projected Enrollment (FTE) in Year One: 20 FTE   **At Full Enrollment by Year:** 2010: 80 FTE

Proposed New Funding: YES

Funding Source: **X** State FTE   ___ Self Support   ___ Other

Mode of Delivery

X Single Campus Delivery   (location)   <u>University of Washington, Bothell</u>

___ Off-site   (locations)   _____

___ Distance Learning   (format)   _____

Contact Information (Academic Department Representative)

Name:	Charles Jackels, Ph. D.
Title:	Program Director, Computing & Software Systems
Address:	University of Washington-Bothell
	18115 Campus Way N.E.
	Box 358534
	Bothell, WA 98011-8246

Telephone:	(425) 352-5368 ; (425) 352-5279 (Dept Office)
FAX:	(425) 352-5216\
E-mail:	jackels@u.washington.edu

Table of Contents

Introduction

This document describes the proposed new degree in Applied Computing (AC) at the University of Washington Bothell (UWB). This Bachelor of Arts degree will be offered by the Computing and Software Systems (CSS) program to fill a regional community and industry need for well-educated computer science majors that have specialized knowledge across a wide range of knowledge domains (e.g., business, biotechnology, health sciences, education, the arts and other social/public service sectors).

Given the shortage of baccalaureate programs in computing-related fields in the State of Washington, this program will provide opportunities for students that are interested in the application of computing technologies to specialty areas of their own choice. The design of our program is based on an innovative and interdisciplinary core curriculum that has been offered by UWB for over ten years. Fundamental differences between the proposed new AC degree and our existing Bachelor of Science in CSS include: 1) the requirement to complete a minor area of study (or approved discipline-specific course of study other than computing); 2) a new course that integrates hardware architecture and operating systems focus on application rather than theory; 3) a senior seminar course that requires students to conduct computing-related research within their minor area of study; and 4) reduced emphasis on computer science programming theory – and more emphasis on applying systems thinking to problems within their minor area of study. In addition, program prerequisites for the AC degree are slightly different in that only one course in Calculus in required; however, a general introductory course to computing has been added so that students understand how computing is used in society. Introductory courses of this type are widely offered within the community college system and within UWB's own first-year student courses.

UWB is in the heart of the Seattle, Bellevue, Redmond and South Snohomish County corridor where there are many new innovative companies and organizations that are creating new products and services – and jobs – that require well-educated employees. Our fast-growing region relies on innovative employees – thus we need graduates who possess the requisite critical thinking skills and ability to provide creative technical solutions to complex problems. Presentations of this proposed degree to industry experts, community college leadership and potential students (and their parents) have all garnered strong support for this new degree option at UWB.

1.0 Relationship to Role, Mission and Program Priorities

The proposed BA in AC is another important step in UWB's growth and development to continue to provide exemplary degree programs and course offerings to our region. Careful consideration and thought by faculty, staff, students, and industry/community leadership has been given to this new degree program to ensure that it upholds our mission, vision and core values as described below.

The mission of the University of Washington Bothell states:

UWB holds the student-faculty relationship to be paramount. We provide access to excellence in higher education through innovative and creative curricula, interdisciplinary teaching and research, and a dynamic community of multicultural learning.

Also, a summary of our vision and core values describes UWB as a transformational learning community and a catalyst to enhance the quality of life throughout our region. Our core vales are to provide our students with 1) innovative educational experiences; 2) faculty and resources that reflect our passion for life-long learning and intellectual engagement; and 3) a respectful appreciation for others perspectives.

The new AC degree relates to our role, mission and program priorities for the following reasons:

1) It fulfills regional demands for technology workers in a growing and highly competitive job market. In particular, the AC degree provides opportunities for students to prepare for specialty jobs within a wide range of Standard Occupational Codes (SOC codes) described in the HEC Board State and Regional Needs Assessment Report for 2005 (*See Table B-2.*). The occupational categories – ranging from business/management through agriculture and the trades – all require successful implementations of technology to remain innovative and competitive within a global economy.

2) It builds on the current CSS curriculum, faculty, lab resources, library, community/industry connections, community college partnerships, and our new 1st and 2nd year course offerings. Therefore, new resource requirements will require only limited increases in faculty, staff and other resource requirements commensurate with normal growth in student FTE and coordination of the minor requirements.

3) It will increase access to a wider range of student interests. This new program will be a pathway for many students in other disciplines who may not have access to high technology coursework within their discipline. Also, students (and employers) prefer a recognized, high-quality degree that represents a rigorous course of study that can be applied to specific knowledge domains. New job titles and specialties are developing in many non-traditional computing disciplines – this program will help prepare for these demands.

4) Improving student diversity and interests in technology-related education will be improved. Many underserved and underrepresented groups do not even consider computing as a viable career path; however, when coupled with the possibility of solving real-world problems they become more interested. The AC degree will improve our ability to reach out to new populations.

5) The proposed senior seminar will provide a formal opportunity for our students to study the impact of technology within their specific discipline – a meaningful, transformational learning opportunity.

6) Cross-campus, cross-department and even cross-institutional enrollment (with other four-year and community/technical colleges) opportunities will provide students with an interdisciplinary and diverse university experience.

The innovative nature of our current baccalaureate program was also adopted by the CSS program at the University of Washington Tacoma (UWT) and subsequently adjusted to meet their particular regional needs. This is a testament to the core competencies addressed by our current program at UWB. More recently, UWT has received approval for a BA option for their current CSS program. While their new degree option is slightly different than our proposed BA in AC, they, too, have identified the need for additional options that provide students with the unique opportunity to combine computing with another minor area of study. We believe this program is critical to meeting the educational needs of our students.

2.0 Need for Program

There is a shortage of computing professionals that have education and experience in the application of computing systems AND the requisite background to understand and work within a specific knowledge domain. Technology is pervasive across all jobs and knowledge domains – be it health care, geographic information systems, knowledge management systems, biotechnology and/or media/film. To be competitive in the global economy requires individuals who are skilled adopters/implementers of technologies – and are able to customize hardware and software to meet the specific needs of the organization. This requires applied computing knowledge combined with a working understanding of the discipline in which they work.

This problem is not only recognized at the local level, but also as a national issue. In an article in the New York Times (August 22, 2005), columnist Steve Lohr describes findings from MIT that state:

> *If you have only technical knowledge, you are vulnerable. But if you can combine business or scientific knowledge with technical savvy, there are a lot of opportunities. And it's a lot harder to move that type of work offshore. (Thomas Malone, MIT)*

According to ACM President, David Patterson[4], CS departments, which once erected barriers to the admission of prospective students must reverse these policies and begin recruiting in order to broaden participation in CS. Figure 1 tracks the change in CS popularity among incoming freshmen in the US. According to Patterson, these numbers are a good predictor of graduating seniors four to five years later.

Figure 1: Computer science listed as a possible major among incoming freshmen (From Patterson)
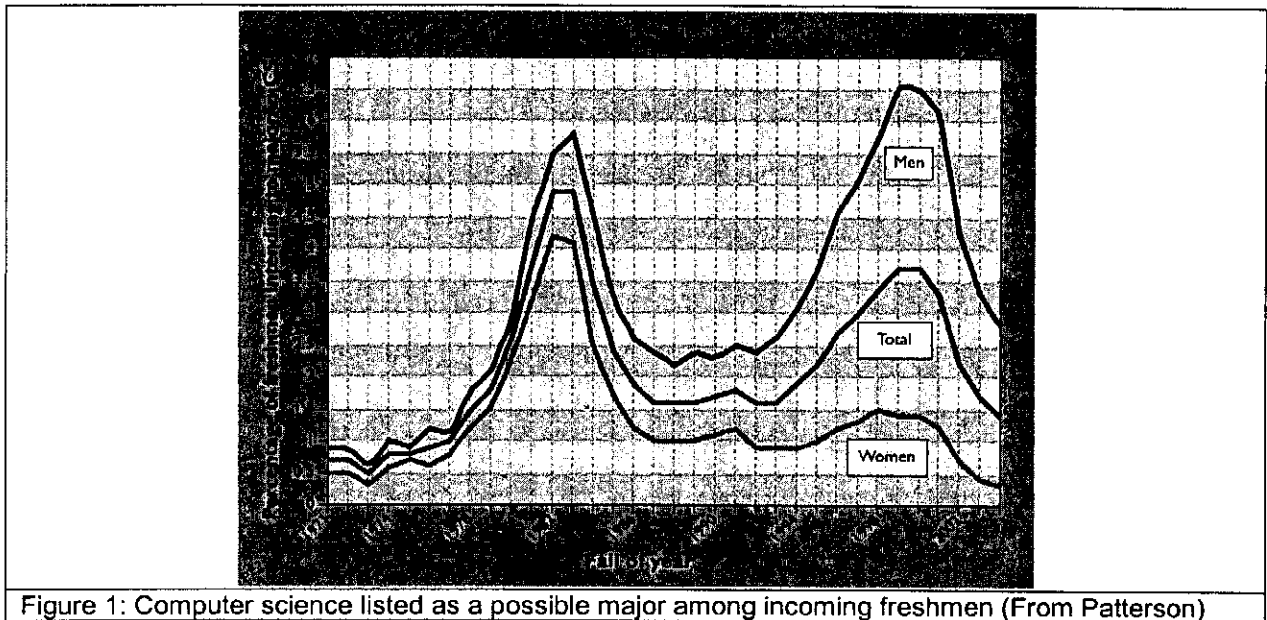
Patterson also observes that in the US today, IT employment is 17% higher than in 1999, 5% higher than the peak of the bubble in 2000, and has exhibited an 8% growth in the most recent year. He further cites IT employment data from the Bureau of Labor Statistics through May, 2004. This data is shown in figure 2.

Figure 2: Annual IT employment in the United States (From Patterson)
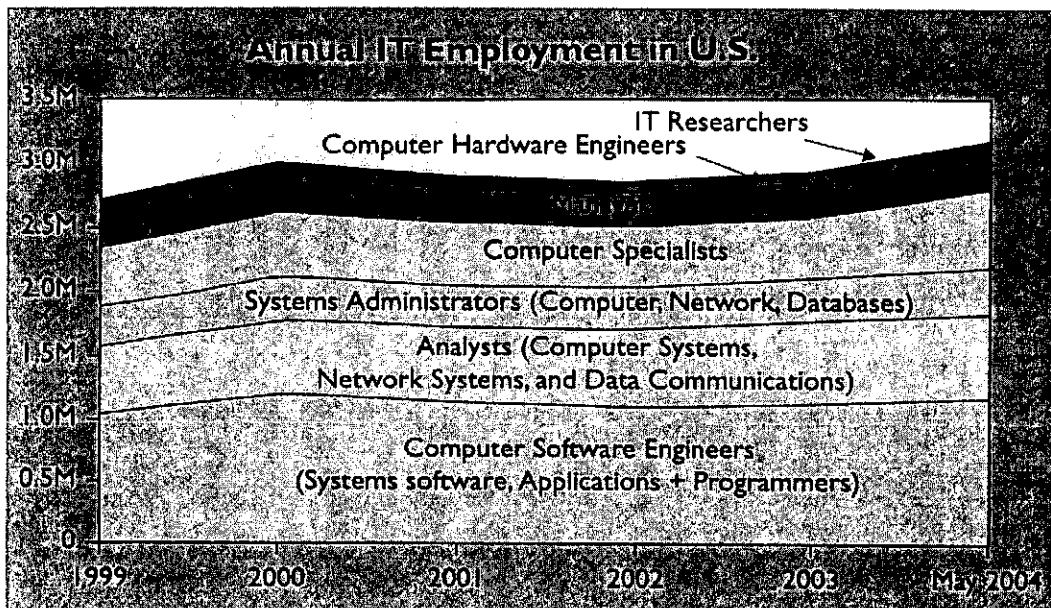
Referring to figure 2 we can see that the growth in IT employment since 2000 has been greatest in the areas outside of traditional application programming, which is just now returning to the employment levels of 2000. These findings – when combined with the

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requirement for the State of Washington to remain competitive and meet the emerging education needs of industry and our citizens – support the need for the new BA in AC. We anticipate that the BA in AC will become a popular choice for technology-oriented students.

2.1 Student Demand

The nature of high-tech jobs is changing, and new niches in the job market as computer specialists in a domain area have been created. Many specific career paths in domain computing areas currently do not correspond to existing degree majors. The Bachelor of Arts in Applied Computing curriculum is designed to fill this need. The curriculum has a computing core with a significant block of credits dedicated to a specific subject area of interest to the student. This curriculum is fashioned to meet the increasing demand for industry-specific computing professionals.

The question of whether or not there is student interest in a high-tech computing field that is customized to student's interest was asked by CSS in a variety of situations. These include:

1. In Autumn Quarter 2006, CSS advisors during classroom visits and UW Majors Day presented the anticipated BA in Applied Computing to approximately 100 students at Shoreline Community College, North Seattle Community College and Seattle Central Community College. There was a general interest in the BA from students enrolled in traditionally engineering and science based programming classes. However, students enrolled in information technology track programming courses were enthusiastic about the applied computing degree.

2. Immediately after Everett Community College faculty received information about the BA, two students contact advising staff to find out how to enroll in the applied computing degree.

3. Since spring of 2006 the BA in Applied Computing has been presented as "anticipated in autumn 2007" to UWB information sessions for prospective freshmen and their parents. At two sessions, April and October 2006, approximately 200 people (100 students plus their families) heard this presentation. There was an enthusiastic response to the addition of an additional UWB degree choice in a computer-related field. Specific favorable comments were received from two students who had interests in computer science and in either linguistics or digital arts. They saw the BA degree with its required minor concentration as one attractive way to satisfy their interests. The wide range of minors at the three UW campuses that might be associated with the BA degree seemed to have particular appeal. The October session was attended by a local high school counselor, who happens to also be the father of three UWB alumni. He expressed enthusiasm for the new degree, because it would provide a wider range of UWB opportunities for his students to consider.

4. In reviewing the UWB Survey of Entering Freshmen and Families conducted in July 2006, it is recognized that the BA in Applied Computing was not the specific focus of any question asked. However, there are a number of survey responses that suggest such a broadening of educational opportunity at UWB would be most welcome by our first group of freshmen and their parents.

When asked on a scale of "1" (Not at all important) to "5" (Extremely important) to rate various factors with regard to being important in their freshman's decision about which college or university to attend, 72% of the freshmen families rated "variety of programs and courses offered" as either "5" or "4", and "Offering the specific program you want" was rated "5" by 39% of the families and "4" by 33% of them. When asked "What are the most important things to learn at UWB?" 23% of freshman families cited "Get a good, well-rounded education." Taken together, these responses indicate that student families in selecting a school for their freshman to attend give great importance to the range of majors being offered and to the ability of those courses of study to deliver a well-rounded education. The BA in Applied Computing clearly expands the available majors at UWB (by approximately 20%) and does so in a way that broadens the offerings into the many areas that have computer related applications. In the sense that the minors can be very broadly chosen, the BA in Applied Computing is an extremely broad degree that should resonate with the sentiments expressed by the families in the survey.

The entering freshmen were also asked to indicate both their likely choice of academic major. Besides the existing UWB majors of CSS, IAS, and Business, the respondents had an "other" option with a free response allowed. Of the 10 cases who checked "other" (out of 98 total) the subject areas entered were: Digital Arts and Media (2); Finance and Economics (2); Psychology (2); Nursing (1); Biology (1); Education (1), and Language Arts (1). Of these, every one of them would provide a relevant subject area for the area of applied knowledge in the BA degree. That is, each of these students could select as their major a BA in Applied Computing degree with an area of applied knowledge closely related to the subject area they indicated.

Finally, families were asked in a free response to indicate "What else is important to your freshman's ability to be successful as a student at UWB?" Two of these responses (with emphasis added) clearly indicate a desire for the type of broad educational option provided by the BA in Applied Computing:

> "Ability to seek guidance with course selections, major, and get guidance toward end career choices *with application of knowledge gained.*"

> "*Variety of majors to choose* and not limited to only a few which forces the student to choose area though *it's not to their academic interest.*"

5. At the inaugural "Chat Lab" held October 25, at least two students responded favorably to an informal description of the new degree being proposed. They thought it added a valuable flexibility to the CSS degree offerings.

6. In a recent discussion with fifteen tribal members from the Tulalip Tribes, high school and community college students expressed strong interest in this new program offering. These students are currently employed with Tulalip Data Services – a partnership program with UWB – and are required to further their education as part of their career development activities.

7. This new degree will also increase the diversity of our student population. A significant number of women and minority students have expressed high interest in the applied nature of the proposed degree program; whereas, much less enthusiasm is placed with more traditional computer science programming degree approaches. We also have student survey results representing all UWB disciplines indicating that "the application of computing skills and information systems" is very important (a score of 5.92 on a scale of 1-*low* to 7-*high*). Also, a significant number of our first UWB freshman class have indicated that computing is of significant interest as a potential career choice.

With the ever-increasing need to design and build systems, student interest in applied computing is growing. A special section of *Communications of the ACM* (July 2006) addressed "services science" (i.e., how businesses leverage and customize technologies to be competitive in the global market) as an important part of the computing industry. According to one author, "Business services, such as computing, information services, and R&D services, generated more than half of all employment growth in many countries in recent years.[3]" As the market for developing and applying information technology to various products and services continues to expand, so will students from many disciplines seek education and credentials to meet these needs.

Based on meetings with community college students, community college faculty & advisors, high school seniors and underemployed workers seeking new career choices, a degree of this type is needed that fills an important niche between information management (e.g., management information systems and programs offered by the UW Information School) and more traditional, engineering-oriented computer science programs. Students express excitement about the interdisciplinary and applied focus for this degree.

2.2 Employer and Community Demand

This degree addresses the regional workforce needs of "technology-enabled" organizations (i.e., companies/groups that rely on and/or will directly benefit from the use of advanced technologies) to meet their specific goals and objectives. This section will describe the findings from several studies and industry reports that support the development of programs such as the AC degree.

Relevance to Industry

There is a clear shortage of computing professionals that have education and experience in the application of computing systems AND the requisite background to understand and work within a specific knowledge domain. The recent Higher Education and Coordinating Board's needs assessment report shows that the gap between the State of Washington's baccalaureate degree production in information technology-related fields and actual workforce demand is increasing.[2] The report describes a clear long-term need for additional computer science/computer engineering graduates; it also describes a critical need for advanced technology workers in areas such as health care, geographic information systems, knowledge management systems, biotechnology and/or media/film – to name a few. To be competitive in the global economy requires individuals who are skilled adopters/implementers of technology – and are able to customize hardware and software to meet the specific disciplinary needs of the organization. This proposed BA in Applied Computing will provide students with the necessary education and experience to meet this need.

Below are some specific examples of how this degree will benefit students. For instance, completion of the BA in Applied Computing with an emphasis in:

- Biotechnology – works with chief scientists to identify software and computing needs for automation, testing and specialized application implementations/development.
- Geography – qualifies the graduate for a position as a Geographical Information Systems (GIS) Analyst.
- Film/Drama – qualifies the graduate for video editing, animation, audio engineering, and other technology-dependent roles within this job sector.
- Public Health/Nursing/Radiology – qualifies the graduate to work in the growing specialty field of health care informatics.
- Humanities/Social Sciences – qualifies the graduate to work in such areas as knowledge management systems (KMS), enterprise resource planning (ERP), and/or customer relationship management (CRM).
- Education – qualifies the graduate for technology transfer and systems development for K-12 initiatives.
- Business – qualifies the graduate for technical sales/consulting engineer.

WTECB Study Results

In 2003, a study sponsored by the Workforce Training and Education Coordinating Board (WTECB) further describes the need for cross-disciplinary technology degree programs. In the final report ***Reconceptualizing a Workforce: New Opportunities for Education and Industry***, 88% of employers from across industry sectors reported stable or increased need for technology workers over the next five years. The study also found that employers are often challenged to align business goals with those of information technologists and suggested the following:

- *Train technologists to be business enablers, to directly assist organizations to meet their strategic goals and objectives.*

- *Develop next generation IT professionals who are well rounded with up-to-date technical skills, industry-specific knowledge, problem analysis skills, customer service skills, and the ability to communicate effectively.*

- *Improve technology literacy for all employees.*

- *Ensure that employees have a solid understanding of the organization's strategic plan so that they can perform their job tasks within the context of the organizations goals and objectives.*

The proposed AC degree would directly address these needs for students and employers. This degree would help companies to better understand and leverage information technology to meet their goals.

Employers in the WTECB study were also asked to identify future technologies that would equate to new demands for IT skills. The following workforce skills were described as playing an important role in organizations ability to compete in a global economy:

- Business assessment and decision support systems
- E-government
- Embedded systems
- Financial systems
- IT Security
- Integrated web applications
- Knowledge and information architecture
- Legal and health care systems
- Usability of handheld device

Bellevue Business Round Table Presentation
In a degree review meeting (September 2006) with the Bellevue Business Round Table (BBRT) group – a group of established industry leaders in areas including construction, commercial real estate, start-up technologies, aerospace, education, and equipment manufacturing (to name a few) – the overwhelming response was very positive for this degree. Each potential employer, regardless of their specialty area – cited the need for employees who could *"speak their (industry specific) language and know how to implement and manage complex technology infrastructure."*

NWCET Findings
Other work on related to industry demand for new programs such as the proposed AC degree is provided by the National Workforce Center for Emerging Technologies (NWCET) funded by Microsoft, the National Science Foundation and Boeing identifies They describe eight "career clusters" that are relevant for most modern organizations.

They include:

- Database administration and development
- Digital Media
- Enterprise Systems Analysis and Integration
- Network Design and Administration
- Technical Support
- Technical Writing
- Web Development and Administration
- Programming/Software Engineering

Within all eight of the clusters there is a common thread of competencies that are needed to support the specialized technical areas. Elements of each of these competencies are all core to the AC curriculum – across all courses. They include:

- Project management, Task Management and Problem-Solving/Troubleshooting
- Cybersecurity
- Process skills such as:
  - Applying a systematic, methodical approach to problem solving;
  - Researching to see who else knows about the problem;
  - Developing a rational set of possible solutions;
  - Testing the solutions in a cost-effective manner;
  - Verifying that the problem is really solved;
  - Documenting the solution for others.
- Ability to use common software applications
- Basic understanding of computer hardware, infrastructure and networks,

Of particular interest in the report was a section on emerging trends, entitled, ***Specialists versus Generalists***. The report specifically describes the following:

> *An interesting divergent trend seems to be emerging in the structure of the information technology workforce in large versus small companies. Large firms seem to gravitate more toward specialization at both the technical and management level. Some technical workers support relatively small groups dedicated to one project that is narrow in scope. As a result, there is a tendency to develop extreme experts in a very tightly focused area.*

> *In contrast, smaller concerns express strong interest in finding individuals with a range of skills, knowledge and abilities. This implies that the employee is able to determine when the firm needs to seek external resources, and to make the case for justifying their use when necessary. It also means the employee is more effective when able to communicate not only laterally, but to all organizational levels. Since students and re-careering adults often start with small concerns, this trend implies that educational and training efforts include activities and assessments that build the student's ability to integrate a range of skills and abilities.*

Together, the findings from the HECB report, BBRT, WTECB and the NWCET all converge and describe industry needs for a new approach to computing education that will attract a new type of student with different needs and expectations from those that are in our current computer-science focused programs.

2.3 Letters of Support

The response to our proposal has been quite strong. We have included letters of support from leadership from local community and technical colleges (CTC's), industry, professional associations and government officials. These statements are included in Appendix B. The BA AC degree will also be presented at an upcoming computer science education conference (SIGCSE'07) early next year. Its selection (via a competitive review process) also indicates the emergence of new methods to educate computing professional as exemplified by our BA AC proposal.

3.0 Support for Statewide Strategic Master Plan for Higher Education

This proposal supports the State of Washington's requirement to provide additional bachelor-level degree programs in computing. This requirement is clearly indicated in the 2005 HECB needs assessment report – and is also supported by state economic development research. Our proposal serves state residents by providing increased access to quality education programs that are important for employment and the general education of our citizens. Much research has demonstrated that – on average – that for each student who receives a baccalaureate degrees in computing, he or she will create between five to eight new additional jobs opportunities for our citizens. These statistics have been included in reports by professional organizations such as the Washington Software Alliance (WSA), American Electronics Association (AeA) and the Prosperity Partnership.

4.0 Relationship to Other Institutions

The new Applied Computing degree option at UWB is designed to provide a new option for our regional student population. It is designed to facilitate educational pathways with local technical and community colleges, provide pathways for entering UWB first-year students and fill an important educational role in the State of Washington to further develop the region's critical technology-related workforce needs. Programs of a similar nature are currently being developed and offered throughout the country with success as they recognize the need for additional technology-related degree options for their students. Some examples of these successful programs are described in section 4.3.

4.1 Community College Articulation and Degree Pathways

Specific transfer and articulation pathways are already in place between UWB and local community colleges. Also, the general community college transfer agreement with UW

will provide a strong entry point into this program. Minors and other concentrations may be completed in a wide variety of areas as listed in Appendix A.

4.2 Comparison to other University of Washington Technology-related Programs

The University of Washington provides a variety of technology-related programs that serve a large population of students.

4.2.1 University of Washington (iSchool): Informatics
The University of Washington's Information School offers a Bachelor of Science in Informatics. This degree is very distinct from the current CSS degree and the proposed AC degree program -- with the only overlap in introductory core courses (CSE 142, 143, and 373). All other computing courses are specialized to the informatics degree program. (http://www.ischool.washington.edu/programs/informatics/)

4.2.2 BA in Computing and Software Systems -- University of Washington Tacoma
As described earlier, this program provides opportunities similar to that being proposed in our AC degree option. Due to distance and the fact that we provide educational opportunities to a different region, there will be limited overlap in populations served by each program. By having two strong programs with similar goals, marketing opportunities may arise as both new programs are introduced.

4.3 Selected Degree Programs Outside of the University of Washington
The degree programs discussed in sections 4.3.1 – 4.3.6 below provide relevant examples of existing programs across the country that have goals and philosophies similar to those of the proposed BA in AC. The existence of these programs demonstrates that many traditional computer science programs are finding a need to create additional applied and interdisciplinary options for students. These programs are not meant to replace current computer science programs – but rather provide additional options for students who may not choose traditional programming-oriented programs.

4.3.1 University of Denver: Applied Computing
The University of Denver offers two *Bachelor or Arts Applied Computing* degrees that are interdisciplinary in nature. One of the degrees is offered jointly thoroughly the Women's College and the Department of Computer Science. This degree has a liberal arts focus and requires a minor in Women's Studies, Business, or Communications. The other degree is offered directly from the Department of Computer Science. This is a collaborative degree with several concentrations available such as Bioinformatics, Digital Media, and Geographical Information Systems. Of other note, the University of Denver has articulation transfer agreements with Colorado Community College system for entry into such programs as those offered by the Women's College.
(http://www.du.edu/cs/degreesUG/index.html)
(http://womenscollege.du.edu/academics/appliedCompMajor.html)

4.3.2 Arizona State University West (The New College): Applied Computing

Arizona State University's New College of Interdisciplinary Arts and Sciences offers a *Bachelor of Science in Applied Computing*. This is a new degree program emphasizing the creation and usage of information with strong liberal arts perspective. The computing requirements are based on one of three concentrations—Digital Media & Graphics Design, Advanced Database Systems, and Network & Distributed Processing. Required courses from liberal arts include areas such as ethics, diversity, and global and cultural awareness. See http://www.west.asu.edu/aco/

4.3.3 DePaul University: Degree Variations

DePaul University offers a variety of baccalaureate computing degrees from the School of Computer Science, Telecommunications, and Information Systems (CTI) and the School of New Learning (SNL). CTI Bachelor of Science degrees in common disciplines such as Computer Science, Information Systems, and Information Technology, but they also have a number of specialized degrees such as Digital Cinema, Computer Graphics and Animation, HCI, and Information Assurance and Security Engineering. Each degree has distinct requirements that do not appear to be just concentrations around a computer science core.

SNL and CTI offer a joint degree in *Bachelor of Arts in Computing* that is a specialization of SNL's *Bachelor of Arts with an Individualized Focus* degree. The degree is liberal arts focused with emphasis on individualized electives. (http://www.cs.depaul.edu/programs/) (http://www.snl.depaul.edu/prospective/ba_computing.asp)

4.3.4 Renssalaer Polytechnic Institute: Information Technology

Renssalaer Polytechnic Institute offers an interdisciplinary Information Technology program with twenty one well-defined concentrations in a variety of fields including arts, building science, business, psychology, medicine, and science informatics. Eight courses are required in a concentration including a capstone domain course in addition to the information technology course requirements. A student may apply for individualized concentration of study as well. See http://www.rpi.edu/dept/IT/undergrad/index.html

4.3.5 Southern Utah University: GIS / Forensics

Southern Utah University's College of Computing, Integrated Engineering, and Technology offers two specialized concentrations in Geographical Information Systems (GIS) and Forensics for their *Bachelor of Science in Computer Science* degrees. These are interdisciplinary programs with in-depth coursework (7-10 courses) in domains outside of computing specific to the concentration. The core computing requirements for GIS emphasizes the internet, while the Forensics computing requirements emphasize computing hardware and infrastructure.
(http://www.suu.edu/ciet/csis/programs.html)

4.3.6 Georgia Institute of Technology: Computational Media

Georgia Institute of Technology's Computational Media major is a joint offering from the College of Computing and the School of Literature, Communication, and Culture. The

curriculum includes a number of specialized courses oriented to digital media with emphasize of design aspects from both an HCI and general communications perspective. (http://steel.lcc.gatech.edu/~rmenon/gsa/flash.php)

5.0 Detailed Program Description and Curriculum

This degree program is designed to facilitate early planning for high school seniors, community/technical college students and transfer students from other four-year institutions. The program prerequisites are generally common requirements for many different majors (or minors) and will help students be properly prepared for our program. As stated earlier, the new program does not require two courses in Calculus as in our BS in CSS program – but rather one. Of course, students wishing to pursue the more programming-oriented BS in CSS degree may take the additional math and programming requirements – and may then switch to the BS degree option.

5.1 Program Prerequisites
Program prerequisites include the following courses:

High School Core Subject Requirements - must be completed before admission to the University of Washington

Writing (3-5 credits)
This may include advanced composition, writing "W" intensive course, or Introduction to Technical Writing

Advanced English Composition (5 credits)

Mathematics (10 credits)
Math 124: Introductory Calculus
Introductory probability/Statistics (100-level minimum)

Programming – (10 credits) CSE 142/143 (or equivalent transfer course) or CSS 161/162 (new courses currently offered in our freshman curriculum).

General Computer Literacy – Any technology-related course that introduces students to the use of computers and how they are used within society. An example of such a course includes:

CSS 105: Interdisciplinary Information Technology (or any survey of computing course))

5.2 Program/Curriculum Description (Form 4)

Program Requirements: The BA in Applied Computing will require completion of a core set of courses (25 credits) that emphasize software engineering methodologies,

programming concepts, technical writing, knowledge of hardware/operating systems and effective technology management/innovation strategies. CSS elective course requirements include 35 credits. Students must also identify a core knowledge domain (25 or more credits) that is approved by the department to represent a specialty knowledge area (e.g., via an existing minor, concentration or other approved domain pathway) for each student. Students will also complete a senior project that demonstrates their ability to combine computing knowledge with their domain expertise.

Required/Core Courses: 25 Credits

(One of the following two programming courses...)
CSS 342: Mathematical Principles of Computing OR
CSS 263: Programming & Discrete Mathematics

CSS 301: Technical Writing for Computing Professionals
CSS 350: Management Principles for Computing Professionals
CSS 360: Software Engineering
CSS 421: Hardware Architecture & Operating Systems

Other CSS Electives: 35 Credits

Sample Courses include: (See UWB catalog for full list of CSS courses)
  CSS 371: The Business of Computing
  CSS 427: Introduction to Embedded Systems
  CSS 461: Software Project Management
  CSS 432: Network Design
  CSS 475: Database Systems
  CSS 480: Principles of Human Computer Interaction
  CSS 490: Special Topics such as Knowledge Management; Social Computing;
    Services Science; Healthcare Informatics (many of these courses will be
    converted to regular course numbers)

Minor (minimum 25 credits) or any other non-computing related Major (or approved course of study)

This must be an approved minor, concentration or major from another department or program. Students may also work with CSS faculty and program advisors to develop custom knowledge domain expertise – subject to departmental approval. If student has a baccalaureate degree in another area, this requirement may be waived.

Senior Seminar (5 credits)
CSS 496: Senior Seminar & Capstone Research

6.0 Infrastructure Requirements

Currently, the CSS program has available to it the same infrastructure resources that are provided to all UWB programs. These resources include, Counseling Services, Disabled Student Services, Library and Media Center, Quantitative Skills Center, and a Writing Center. The technological resources include the Information Systems department, the Campus Media Center, and electronic podium classroom technology.

CSS has two drop-in labs, five research labs as described below, and a professional staff position for program technical support. In addition there are four computer classrooms available for CSS use. These specialized labs and personnel will be leveraged to meet requirements of our new degree option.

Counseling Services
Confidential, short-term Personal Counseling is available to currently-enrolled UWB students free of charge. Students may utilize counseling for a wide range of personal concerns such as anxiety, depression, relationship difficulties, or adjustment issues. All services are offered in a safe and supportive environment.

Disabled Student Services
The University of Washington Disability Support Services office (DSS) is firmly committed to ensuring that qualified students with documented disabilities are provided with an equal opportunity to participate in the variety of educational, recreational, and social opportunities available at the University. The primary functions DSS performs towards this objective are the provisions of academic accommodations for students with a documented, permanent or temporary physical, mental, or sensory disability; resource and referral information; and advocacy support as necessary and appropriate. Academic accommodations for each student are determined on an individual basis with input from the diagnostician or physician (usually from the diagnostic report), the student and the Counselor or Director of the DSS office.

Library
UWB Library is part of the University of Washington Library system which provides access to over five million volumes and twenty-four libraries. Reference services are available during regular library hours. One of the main features of the UWB Library is an Information Commons, which offers state-of-the-art technology and provides access to online searches, cd-rom, and web-based resources, including full text journals. These resources can be accessed remotely.

Media Center
The Campus Media Center (CMC) provides a variety of services to UWB students, faculty and staff. In addition to maintaining and circulating the local media collection, staff also provides media research and procurement services. The CMC also assists in the development of media-related materials for instruction and provides training to faculty and students in the use of media and technology. Additional services include audio and video production as well as photographic & digital imaging production. The CMC also

provides support to UWB's highly technical classrooms. Each room is equipped with state-of-the-art instructional technology including an electronic podium with an on-board instructor computer and media playback devices. Finally, the CMC coordinates the distribution of cable television throughout the instructional areas of the campus.

Quantitative Skills Center
The Quantitative Skills Center is open to anyone who wants academic support with a quantitative question for one or more of their classes. You don't need to be in a math class to receive help at the QSC. The QSC offers free tutoring for all UWB students, staff, faculty, and alumni.

Writing Center
The UWB Writing Center supports student writing in all academic programs by providing individual and group consultations (face-to-face and online), workshops, and classroom instruction. As our schedule permits, we are also happy to assist members of UWB's extended community.

Information Systems
The University of Washington, Bothell provides a broad array of computing resources and services to all students, staff and faculty. The Information Systems department provides basic computing support to UWB faculty, staff, and students. It maintains computer classroom and labs, provides technical assistance to faculty for both teaching and research, databases, educational technology efforts, and administrative access to information and maintains a robust, secure and stable networking environment providing e-mail, file storage, and back-up services

CSS Lab Resources

The Computing and Software Systems Program utilizes cutting edge technology and research tools as an integrated part of its curriculum. Enrolled students can access our CSS Windows Lab and Linux Lab during regular quarters. CSS students working with faculty research have the opportunity to access the Embedded and Networking Systems Lab, the Center for Integrated Teaching, Learning and Scholarship, and the Biocomputing Lab.

Windows Workstation Lab: The Windows lab houses 32 workstations running Windows XP SP2 Microsoft Office and Visual Studio 2003.Net, as well as other more standard software development application. The Windows lab is used for general computing need of students taking classes that require word, processing, computer programming and visual publication. The Windows lab has four developer workstations created for group programming and group projects.

Linux Workstation Lab: The Linux lab is available to all currently enrolled CSS students. It has 30 workstations running Red Hat Enterprise v.3, GNU and C++ compilers, and Sun Java compilers. There are three developer workstations and three group project tables in this lab. Our Linux lab also offers remote access for those students

who prefer to work from home, or whose schedules don't allow them to visit the campus frequently. The Linux lab has three developer work stations created for group programming and group projects.

Embedded Systems and Networking Lab: Students enrolled in an embedded systems course, or a network design course has access to the lab for the quarter. In addition, students who are working on research or a project with a faculty member can request lab access. The lab runs 7 workstations with Windows XP Sp2, 68K development software and Metrowerks CodeWarrior. There are 10 Hewlett-Packard Logic Analyzers, and 16 of the workstations run both Windows XP SP2 and RouterSim for our networking classes. The Embedded Systems and Networking lab has two developer work stations created for group programming and group projects. Network simulations using state-of-the art switching and routing equipment (donated from Nortel Networks) are also available for research and lab exercises.

The Center for Integrated Teaching, Learning and Scholarship: The Center for Integrated Teaching, Learning, and Scholarship (CITLS) is composed of several smaller laboratories, and is housed in an 1150 square-foot space in the CSS Program. All laboratories within the Center are interconnected via gigabit Ethernet, which in turn is connected to the UWB campus backbone and the Internet. CITLS computing facilities include: two dual processor Sun Ultra 60s with Expert 3D graphics and 1 gigabyte RAM (one with a 24 inch wide-screen display), two Sun Ultra 10s with Creator 3D graphics, a 12 processor Linux cluster with a dedicated 4 gigabit per second Myrinet network interconnection and 6 gigabytes RAM, several Windows PCs with high-end graphics hardware, Linux PCs, Macintoshes running Mac OS X, and media acquisition devices (digital video cameras, microphones, etc). Much of the initial outfitting of the laboratory, including installation of the gigabit networking, was made possible by support from a Worthington Technology Endowment awarded to Center faculty.

The Biocomputing Laboratory (BCL): is a home for teaching, learning, and research for computer scientists, engineers, biologists, and theoreticians interested in combining discoveries in computing, biology, engineering, and mathematics to improve our understanding of biology and to build better computer systems. The BCL has a multidisciplinary focus, with great emphasis placed on bridging the semantic gap between these fields of study. Current work in the BCL falls into five major categories: Neuronal Coding, Sensorimotor Systems and Central Pattern Generators, Informatics, Computational Neuroscience, Biocomputing education.

7.0 Faculty Requirements

The BA in Applied Computing will leverage existing courses and infrastructure of the Computing and Software Systems (CSS) program. Approximately five new (or modified versions of existing) courses will need to be created plus a new Senior Seminar project course. Part of this course revision process includes converting existing CSS special topics courses into regular CSS elective courses. We anticipate one new staff position

(1.0 FTE) and a dedicated faculty line (1.0 FTE) upon full roll-out (40 FTE) of the proposed degree option. First year student enrollment targets are for 20 FTE using a cohort model (i.e., for the core courses only) – with an expected new cohort starting each year. The program will be designed as a two-year program available to qualified UWB students and community college transfer students. Full enrollment is anticipated by 2010 with an estimate of 40 FTE.

8.0 Administrative Support Requirements

Support is requested for 0.5 FTE advising staff for recruiting, cross-program minors/concentration advising, and graduation requirements determination. See 9.0 (Student Support) and 12.0 (Budget) sections for detailed descriptions of activities and funding requirements.

9.0 Student Support

Advising

CSS is committed to high-quality student advising. CSS advising is responsive to issues and concerns of our undergraduate students. As a result we have created programs and events that benefit the educational processes.

The programs and events include regular events such as the CSS Chat Lab, and Popcorn and a Movie. The CSS Chat Lab is an opportunity for student to interact with the CSS Director, faculty, and staff on an informal basis. Popcorn and a Movie is an event specifically created to integrate UWB freshpersons into the CSS atmosphere by intermingling with CSS students, faculty and staff. CSS also supports ACM our computer science student professional chapter to create events designed at bring students together for social gathering and collaborative scholarship.

The Peer Mentoring Program is aimed at helping new students make the transition to the University of Washington, Bothell CSS program. Students and alumni who serve as mentors will have recently been through the issues experienced by new CSS students, and will complete a peer mentoring orientation. They will serve as a sympathetic ear and a friendly guide to the University of Washington Bothell, as well as the Bothell/Seattle community at large.

As a service to the students and community, in 2002 the Computing & Software Systems program created the CSS Speaker Series. The CSS advising staff supports the production of this lecture series. The purpose of the lecture series is to promote continuing education for the community and alumni, as well as connecting industry representatives to our student population. The lecture series sponsors guests from a vast range of areas such as, encompassing aspects of manipulating and creating digital technology, nanotechnology, software project management and computer graphics and animation. On average, we host approximately nine speakers every academic year (autumn to spring quarter).

In addition, CSS advising support provides assistance to the faculty sponsor for our Departmental International Exchange Program. The CSS Departmental Student Exchange to Ehime University was created to especially support Munehiro Fukuda's Grid Computing Research. CSS sent one graduate student and two undergraduate students to Matsuyama, Japan. Two students from Ehime University visited CSS each for one year to take classes and participate in grid computing research.

CSS advising is a full service office that participates in the marketing, recruiting and advising of our undergraduates. The general process for tracking CSS students in advising begins with regularly auditing and updating files with coursework as it is completed. Students are notified of any potential problems, especially relating to focus or degree progress. When a student is nearing graduation, he or she will make a final advising appointment to apply to graduate. A final degree audit is conducted and the application for the bachelor's degree is filed. Students are also informed about the College's Graduation Celebration.

To help understand the variety of services provided by the Student and Academic Services Office, a list of regular office staff activities is provided below: Recruiting prospective students at various venues including the UWB Transfer Student Fair, UW Major's Day events at community colleges, and the UWB/Community College Advisor's Open House. Coordinates career events such as: CSS Alumni Career Panel, CSS Technical Resume Workshop, and CSS Mock Technical Interview Workshop. Advising also organizes and participates in Community College classroom visits and meetings with computer science faculty, and a CSS Graduation Celebration prior to UWB Commencement. CSS advising managed and organized the CSS 10th Anniversary celebration with special events. Also, advising coordinates the CSS Colloquium that is the completion of the senior capstone projects which is an experiential learning experience through internships in the community, participation in research projects, and group or individual projects guided by faculty. Upon the completion of the cooperative education the student is required to sign up for the CSS Colloquium that includes a poster presentation, and a ten to fifteen minute oral presentation in front of peers, CSS faculty, staff industry sponsors, and the community.

To support student services advising also provides a variety of office tasks that includes creating and maintaining e-mail lists for CSS students and CSS alumni, conducts a CSS Exit Survey and maintains a database for the survey results, creates content and maintains pages for the CSS website, advises Director and maintains the CSS time schedule, assists faculty in new course and course change applications, provides the Director with a variety of statistical reporting. CSS advising develops program materials, including: the CSS Admissions Guide, CSS 497 Cooperative Education Student Guide, provides content for recruiting publications and the UWB General Catalog, and creates advertising for events and courses on campus.

UWB CSS adopted the use of the Degree Audit Records System (DARS) in 2004. Other programs at Bothell and Tacoma are just now adopting this automated system of tracking academic progress toward completion of a degree.

Admissions

Students may apply to the Applied Computing degree after completing a set of admission prerequisites that include: English Composition, Advanced Composition or Technical Writing, a survey of computing course, CSS 161 and 162, statistics and Math 124. Prospective students will be able to apply at the end of their freshmen year.

Admission to the Bachelor of Arts in Applied Computing will embody the collaborative interdisciplinary spirit of the degree, and of the faculty. The UWB CSS faculty backgrounds and degrees include a wide range of disciplines including: Computer Science, Physical Chemistry, Organizational Psychology, Mathematics, Economic Geology, and Business. The Admission Committee is comprised of three faculty members, and two advising staff as ex officio members. Besides reviewing admission prerequisites and grades, the committee will also look at other supporting documentation such as the student's goal statement, work experiences, extracurricular activities, and unusual academic circumstances.

At first, the Applied Computing admissions committee will follow a process similar to that for the BS degree. The CSS Admission Committee will review applications of both the CSS degree and the Applied Computing degree together. The prerequisites are similar, and the applications deadlines are the same. This will allow greater flexibility for students who may wish to move between the two degrees. After admission to the degree program, Advising staff will meet with each student for orientation, planning, registration and a review of resources. Newly admitted students in Autumn Quarter will participate in the UWB Convocation

Marketing

Recruiting for the Applied Computing degree began in Autumn Quarter 2006 in anticipation of the degree starting in Autumn 2007. Classroom visits and UW major day presentations have begun at area community colleges. Admissions advisors have been educated and have begun recruiting students. Student advisors from other institutions will be informed on the Applied Computing degree at UWB Community College Advisor Day, UW Majors days, UW general advisors will be notified of this new major by the advisors e-mail list, community college computer science faculty will be informed of the degree during our annual faculty visits.

Additional funding will be need in this year and next year to create publications and to meet our marketing challenges. The Director and advising staff with meet with the UWB Publications Office to create a marketing scheme to include radio ads, newspaper ads, and a variety of brochures. Our marketing challenge will be explaining the new major and imprinting the career path on prospective students. Since there are a wide range of

domains possible for this computing degree we will need to cast a broad net for our advertising.

Diversity Plan

The proposed BA in Applied Computing program is committed to the principles of a diverse student population as articulated by the University of Washington. Every effort will be made to recruit and retain a diverse student body. We seek applicants with a wide range of interests, including business, engineering, sciences, social sciences and humanities.

The University of Washing has in place anti-discrimination policies that are reprinted in the University Handbook and disseminated to students, staff, and faculty. Those affiliated with this proposed program are strongly committed to implementing these policies.

The demographic draw of UWB campus and its undergraduate programs ensures a representative mix of students with respect to individual characteristics, experiences, culture, ethnicity, and physical abilities. For example, in 2005 58% of enrolled students were women and 45% were not Caucasian.

UWB has an Inclusiveness Committee which is a Chancellor appointed committee comprised of faculty, staff, and students. The goal of the committee is to ensure that UWB is a place where all students, faculty, and staff feel welcome and supported in an equitable manner as they pursue personal, professional, and academic goals consistent with UWB's role and mission.

Measures at UWB to promote nondiscrimination, equity and diversity include:

- Putting special emphasis in recruitment literature and activities on those venues and channels of communication that reach the traditionally underserved.

- Prioritizing the establishment of organizational connections with regional partners in the public, non-profit and private sectors that address the needs and priorities of diverse regional groups.

- Including the University of Washington nondiscrimination statement on position announcements, student recruitment material, and application forms.

- Advertising in minority publications and distribution of materials and announcements to minorities and minority groups.

- Using informal and professional networks to assist in the identification of potential candidates from underrepresented groups.

- Managing events for potential students to enable potential students to meet with faculty and staff to learn about the proposed programs and its admission policies.

UWB advising and recruiting staff actively seeks populations of students that are traditionally under-represented.

Measures in CSS to promote nondiscrimination, equity and diversity include:

- CSS fosters internships that promote diversity such as student senior projects at the Vietnamese Youth Society, and the East African Center. There were twenty-five internships for the Tulalip tribes building and maintaining technology infrastructure.

- A faculty sponsored research project in knowledge management computing conducted in collaboration with computational linguists and tribal cultural preservation experts to preserve endangered tribal languages in knowledge management computing. Lushootseed (a tribal language once spoken by over 40 tribes in the extended Puget Sound Region) now only existed in the minds of a dozen tribal elders.

- CSS faculty have helped to produce diversity conferences such as "Earth Rites: Imagination and Practice in Sci-Arts Eco-culture" Conference.

- CSS teaches CSS 490 – Social Computing, this course examines how the social, cultural and cognitive sciences explain/influence next-generation multi-user computing application design and their impact.

Such efforts contribute to openness regarding diverse ideas, viewpoints, and belief systems, which in turn leads to increased knowledge and interest in understanding the varied perceptions of computing in a diverse society.

10.0 Program Assessment Strategy

CSS anticipates that the Applied Computing degree will be a dynamically changing field just as the Computing and Software Systems has been in the past ten years. During the Program's first decade two major curricular revisions have taken place to add student course flexibility, and provide a broader range of educational tracks. Recent curricular changes to the program have been made to accommodate lower division classes. These changes were necessary to increase the program's ability to respond to a rapidly changing high-tech profession. The Bachelor of Arts in Applied Computing assessment strategy will follow a similar flexible plan in assessing teaching and learning.

The CSS faculty responds to student matters by way of advisors and faculty through the Curriculum Committee, Admission Committee, Strategic Initiatives Committee, and the Director. Student comments are provided to the advising staff and the Director directly and indirectly through course grades and self-evaluations of teaching. The program advisor provides a venue for students to discuss their progress towards a degree as well as offer program suggestions. Student feedback is provided through course evaluations,

anonymous web e-mail, feedback from the CSS student organization, and public forums such as CSS Chat Lab. The CSS Chat Lab promotes informal conversations, and is a monthly event co-sponsored by the Director and the CSS student organization and attended by other faculty, staff and students. Many feedback loops are in place to ensure students concerns are moved to the whole faculty. More systemic or problematic issues are forwarded to the Director who also serves as the Undergraduate Program Coordinator and meets weekly with the CSS Advisor. Next in line are the program's curriculum, admission committee and Strategic Initiatives Committee. Recommendations from these committees and the Chair may be brought to the entire faculty, as part of a holistic assessment process which may include curricular review.

The UW maintains a periodic program review that includes peer review, UW faculty review and an external review. In addition, CSS is reviewed as a part of UWB for academic accreditation.

The program will convene an industrial board periodically to assess the match of the BA graduates to the need of the community employers. Alumni will be surveyed on a regular basis to obtain longitudinal data regarding the program satisfaction on the part of the graduates.

11.0 Student Assessment Strategy

Students are assessed by various methods that are oriented towards ensuring that the student's educational outcomes are being met. The department uses several forms of assessment:
- Course grades
- Course student evaluations
- Student exit survey
- Student Graduation Requirements Audit
- Senior capstone project

Course grades: For those learning competency outcomes that are closely matched to specific course content, student grades provide an excellent measure of satisfaction of outcomes. The advising staff reviews all grades each quarter and identifies students that are not making satisfactory progress towards the degree. These students are called in for an appointment with an advisor to discuss what measures they should take to remedy the situation. The program hires students to tutor in our drop-in computer labs, and there are additional tutors for CSS courses available through the Quantitative Skills Center. CSS provides a peer mentoring program for newly admitted students that matches them with an alumni or a senior to provide mentoring.

Course student evaluations: Courses in the program are formally evaluated through OEA-sponsored surveys by students. As another form of student feedback, the Director reviews the OEA results and student comments.

Student exit survey: Students are administered exit surveys at the end of their senior capstone project. These surveys assist the program in evaluating domain areas, career paths, and allows for program suggestions.

Student Graduation Requirements Audits: The audits show how a student's University of Washington courses, transfer courses, and courses in progress apply toward degree requirements. It will be used as a tool to aid faculty in creating new cluster courses for students in domain areas.

In the senior capstone class CSS 496, students in a group seminar will produce a report describing a development, survey, or small research project in applied computing in an application to another field. This will serve to combine the two sides of their degree through their senior seminar. With guidance from a faculty advisor, students implement a working knowledge of their computing skills within the context of their field of interests.

The combination of all of these metrics provides the program with a wide-ranging picture of the relative strength of the curriculum and the progress of its students as seen from the point of view of most of our constituents.

12.0 Budget

The largest part of this program coincides with instruction already offered by the CSS Program in conjunction with the existing BS degree. Except for the administrative aspects of the BA degree, it is not practical to disentangle the faculty contributions to the two degree programs. For example, the faculty effort involved in teaching CSS 342 cannot be practically separated into that for the BA degree separate from that for the BS degree. We estimate the mature size of the BA degree to be 40 FTE, which would correspond roughly to 20% of the overall undergraduate program. Using these guidelines the required forms are completed as follows:

Form 5. Enrollment targets are created by assuming gradual growth to 40 FTE, which would be 18% of an overall mature program of 220 FTE. We assume that at maturity the cohort of BA students will be 20 FTE per year. Our headcount targets are calculated by assuming the same headcount to FTE ratio as the BS program (1.5) and then increasing it to 2.0, since the BA students will be taking 25 fewer credits in CSS. The graduation rate is calculated as 80% of the 2nd year FTE students, based upon previous experience.

Form 6. Other than the director who will devote 20% of his time to administering the BA program, the rest of the faculty are assumed to devote 18% of their time on average, as that represents the overall fraction of BA FTE's in the overall program. (*See Appendix B for listing of faculty including brief profiles.*) It is estimated, based on experience, that 0.5 FTE Program Coordinator will be needed for academic advising and other support activities specific to the BA degree. At the start the BA Program will require development and annual offering of three new courses (CS10X, CSS 421, and CSS 497) and the influx of new students will probably require teaching an extra section of CSS

301. These four additional courses represent approximately 0.80 FTE of a regular faculty appointment, even in year-one when enrollment is expected to be somewhat low. By year four, when the program enrolls 40 FTE, a total of two faculty lines would be justified based on the present 20:1 student:faculty metric. These percentages are reflected in Form 6.

The new degree program will require additional staff support in the areas of marketing, recruiting and advising. We anticipate the need for an additional 0.5 FTE to provide services specific to our new degree offering -- thus the overall staffing level in the office would be 3.5 FTE. The BA Degree is expected to have both a higher headcount/FTE ratio than the BS program and, more importantly, will require additional student advising when planning (e.g., identifying, scheduling and helping students register) for courses in the student's minor are of study. We also anticipate additional work coordinating between different UW campuses and possibly other higher education institutions – especially when there are "custom" minors or new areas of study that will benefit the student.

Form 7. The faculty and staff resources in this form represent the needs discussed above under Form 6. The salary parameters used are: Director (12 mo) $155,000; Avg Faculty (9 mo) $90,000; Program Coordinator (12 mo) $45,000; Tuition $5859/student; State support $9000/student; Hourly pay rate for graders $12; and average annual inflation 5%.

13.0 External Evaluation of Proposal

We request that external reviewers be sought from programs that have developed similar programs. Two candidates for external reviewers may be selected from the programs identified in section 4.0 of this proposal. We do not have any specific connections with other non-UW programs that are identified in section 4.0.

Cited References:

[1]*Reconceptualizing the Information Technology Workforce: Challenges and Opportunities for Education and Industry.* Technical Report for the Workforce Training and Education Coordinating Board (Erdly, William and Howland, Joy). December, 2003.

[2] *State and Regional Needs Assessment Report.* Washington Higher Education Coordinating Board (October 2005).

[3]Sheehan, Jerry. "Understanding Service Sector Innovation." *Communications of the ACM.* July 2006, Volume 29, Number 7, p.43.

[4]David A. Patterson, *Restoring the Popularity of Computer Science, Communications of the ACM,* September 2005, Volume 48, No. 9, pgs. 25-28

FORM 7

SUMNMARY OF PROGRAM COSTS AND REVENUE
Part II

Program Expenses							
	FTE	Benefits	Year 1	Year 2	Year 3	Year 4	Year n
Administrative Salaries							
Director (12 mo/yr)	0.2	0.238	$38,378	$40,297	$42,312	$44,427	$46,649
Faculty Salaries							
Faculty (9 mo/yr)	0.8	0.238	$89,136	$93,593	$98,272	$103,186	$108,345
	0.5	0.238			$61,420	$64,491	$67,716
	0.5	0.238				$64,491	$67,716
TA/RA							
Clerical							
Prog Coordinator (12 mo/yr)	0.5	0.309	$29,453	$30,925	$32,471	$34,095	$35,800
Other Salary (hourly graders)	240	0.11	$3,197	$3,357	$3,524	$3,701	$3,886
Financial Aid							
Contract Services			$10,000	$10,000			
Goods and Services							
Travel			$500	$500	$750	$1000	$1000
Equipment			$5,000	$5,000	$5,000	$5,000	$5,000
Lease or Acquisition							
Other							
Indirect							
Total Costs			**$175,664**	**$183,671**	**$243,749**	**$320,392**	**$336,111**

Program Revenue							
			Year 1	Year 2	Year 3	Year 4	Year n
Student FTE			**10**	**20**	**30**	**40**	**40**
General Fund: State Support			$90,000	$189,000	$297,675	$416,745	$437,582
Tuition and Fees (total)			$58,590	$123,039	$193,786	$271,301	$284,866
Corporate Grants/Donations							
Internal Reallocation			$38,378	$40,297	$42,312	$44,427	$46,649
Other Fund Source							
Total Revenue			**$186,968**	**$352,336**	**$533,773**	**$732,473**	**$769,097**

Parameters

Director Salary (12 mo)	$155,000
Avg Faculty Salary (9 mo)	$90,000
Prog Coord Salary (12 mo)	$45,000
Avg Inflation Rate	1.050
Tuition	$5,859
State support	$9,000
Grader Hourly Pay Rate	$12

Form 5

Enrollment and Graduation Targets

We estimate that program marketing and recruiting will take one year to achieve full visibility of this new program. Students are generally enrolled 2/3 time thus the 1.5 to 1 ratio of headcount/Student FTE. If additional FTE are needed due to high demand, we will work within the UW strategic planning process to obtain further FTE. UWB is expected to grow and typically has new FTE allocated for campus growth.

Year	Year 1	Year 2	Year 3	Year 4	Year n
Headcount	15	30	45	60	60
Student FTE	10	20	30	40	40
BA AC Graduates	none	10	20	25	25

FORM 6

PROGRAM PERSONNEL
Part II

Faculty				
Name	**Degree**	**Rank**	**Status**	**%Effort**
Jackels, Charles	Ph.D	Professor and Director	Full Time Permanent	0.20
Cioch, Frank	Ph.D	Professor	Full Time Permanent	0.18
Erdly, Bill	Ph.D	Associate Professor	Full Time Permanent	0.18
Sung, Kelvin	Ph.D	Associate Professor	Full Time Permanent	0.18
Stiber, Michael	Ph.D	Associate Professor	Full Time Permanent	0.18
Olson, Clark	Ph.D	Associate Professor	Full Time Permanent	0.18
Fukuda, Munehiro	Ph.D	Assistant Professor	Full Time Permanent	0.18
Zander, Carol	Ph.D	Senior Lecturer	5-year Contract	0.18
Berger, Arnold	Ph.D	Senior Lecturer	5-year Contract	0.18
New Position Yr 1	Ph.D	Assistant Professor	Full Time Permanent	0.18
New Position Yr 3	Ph.D	Assistant Professor	Full Time Permanent	0.18
			Total Faculty FTE (after year 1)	**1.82**
			Total Faculty FTE (after year 3)	**2.00**

Administration and Staff				
Name		**Title**	**Responsibilities**	**%Effort**
Hunter, Megan		Prog Coordinator	Advising/Recruiting	0.50
Meske, Dina		Counseling Svcs Coordinator	Oversight	0.17
			Total Staff FTE	**0.67**

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Appendix A

Minors Offered by the University of Washington

UW-Bothell minors

- Business Administration
- Computing and Software Systems
- Education
- Human Rights
- Information Technology
- Policy Studies

UW-Seattle minors

College of Architecture and Urban Planning

- Architectural Studies
- Landscape Studies
- Urban Design and Planning

College of Arts and Sciences

- African Studies
- American Indian Studies
- Anthropology
- Applied Mathematics
- Art History
- Asian Languages and Literature
  - Chinese
  - Hindi
  - Japanese
  - Sanskrit
- Atmospheric Sciences
- Canadian Studies
- Chemistry
- China Studies
- Classics
  - Classical Studies
  - Greek
  - Latin

- Classics and Ancient History
- Comparative History of Ideas
- Comparative Islamic Studies
- Comparative Literature
- Comparative Religion
- Dance
- Earth and Space Sciences
- Environmental Studies
- European Studies
- Geography
- Germanics
    - Language and Literature
    - Linguistics
    - Cultural Studies
- History
- History of Science
- Human Rights
- International Studies
- Italian
- Japan Studies
- Jewish Studies
- Korea Studies
- Labor Studies
- Latin American Studies
- Law, Societies, and Justice
- Linguistics
- Mathematics
- Microbiology
- Music
- Near Eastern Languages and Civilization
- Philosophy
- Physics
- Political Science
    - American Government
    - Comparative Politics
    - International Relations
    - Political Science (general)
    - Political Theory
- Religion (Comparative Religion)
- Romance Languages and Literature
    - Italian
    - Spanish
- Scandinavian Studies
    - Baltic Studies
    - Danish
    - Finnish

- o Norwegian
- o Scandinavian Area Studies
- o Swedish
- Slavic Languages and Literatures
  - o Russian Language
  - o Russian Literature/Slavic Literatures
  - o Slavic Languages
- South Asian Studies
- Southeast Asian Studies
- Spanish
- Statistics
- Women Studies

College of Engineering

- Materials Science and Engineering
- Technical Japanese

College of Forest Resources

- Conservation of Wildland Resources
- Environmental Horticulture and Urban Forestry
- Forest Management
- International Forestry
- Streamside Studies
- Wildlife Studies

School of Medicine

- Medical History and Ethics

College of Ocean and Fishery Sciences

- Fisheries Science
- Oceanography

School of Public Health

- Environmental Health
- Public Health

Quantitative Science

- Quantitative Science

UW-Tacoma minors

- Asian Studies
- Computing and Software Systems
- Education
- Environmental Studies
- Hispanic Studies
- Human Rights
- Museum Studies
- Nonprofit Management
- Public History
- Urban Studies

Intercampus minors

- Human Rights - Courses are available at UW-Seattle, UW-Bothell, and UW-Tacoma. A student may complete the minor with coursework from one, two, or all three campuses.

Appendix B

Faculty Member Profiles

CSS courses are taught by faculty who meet the high standards of the University of Washington. The CSS faculty have experience in the software industry and are focused on providing a unique and innovative learning environment for students.

The CSS program at UWB presently has nine full-time, and three part-time faculty with a broad range of teaching interests and real world experience. The UWB CSS faculty have extensive expertise in topics of applied and basic research pertinent to the guidance of the Applied Computing students both inside and outside of the classroom. Many of the faculty have been involved with industry in some capacity, and in doing so bring a spectrum of comparative methodologies, contacts and insights to share with students. The UWB CSS faculty backgrounds and degrees include a wide range of disciplines including: Computer Science, Physical Chemistry, Organizational Psychology, Mathematics, Economic Geology, and Business.

Laurie Anderson
Lecturer
Laurie Anderson, Ph.D. has worked for two decades in the high-tech computer marketplace as a software developer, network manager, competitive analyst, product manager, and technical and marketing writer. Working at both small and large computer corporations, including DEC, SUN, and IBM, she has experience in all aspects of the product development cycle and with mini-, micro-, and personal- computers, operating systems, networking, and computer security. Her varied experience brings a practical, real-world view of computer technology and business communications that she applies to her teaching.

Arnold Berger
Senior Lecture
Arnold Berger, a Senior Lecturer in the CSS Dept., received his BS and PhD from Cornell University. Prior to coming to UWB, he was the Director of R&D at Applied Microsystems Corporation, a manufacturer of hardware and software tools for embedded systems development.
Before coming to Washington State almost ten years ago, Arnie was the Development Tools Manager at Advanced Micro Devices Inc., in Austin, Texas and an R&D Project Manager for Hewlett-Packard Corporation in Colorado Springs, CO. At HP, he was team leader that built the Teramac reconfigurable hardware computing machine. An avid cyclist, Arnie bicycles to UW Bothell from his home on the Samammish Plateau. His research interests include applications of reconfigurable computing to embedded systems and event-based software simulation in embedded systems. Finally, Arnie is the author of two books:

Embedded System Design, published by CMP Press
Hardware and Computer Organization: The Software Perspective, published by Elsevier

Frank Cioch
Professor
Dr. Cioch is a software engineer, with degrees in math, statistics and computer engineering, and a doctorate in Computer and Communications Sciences from the University of Michigan. After obtaining his Ph.D. in 1985, he taught at Oakland University in the greater Detroit area. He moved to Seattle and started teaching at Bothell in Autumn 2000.
Dr. Cioch's technical interests derive from his basic interest in software comprehension, both as it relates to software's internal characteristics and to its utilization in a particular environment. His specialty is assessing the degree of fit of software engineering techniques, tools and methods to any given situation, and tailoring their application to enhance their effectiveness. His practical experience includes serving as a contractor for the U.S. Army, consulting for auto-related companies and participating in the failure of two start-up companies.
Dr. Cioch enjoys teaching because his classes are usually filled with practitioners who are interested in applying what they learn to solve problems they are facing. This affords him an opportunity to make a difference in how they approach their career, a challenge to earn their respect, and a continual source of motivation to keep abreast of current developments.

William W. Erdly
Associate Professor
Dr. Erdly is a graduate of the University of Washington where he earned a M.S. and Ph.D. in social and organizational psychology. He has been involved in the computing field since the mid-seventies, and his interests include software risk management, quality assurance, human-computer interaction, database design, network design, knowledge management systems, and organizational analysis techniques. He has extensive software development and research experience in the aerospace and health care industries and has served as an independent consultant.

Munehiro Fukuda
Assistant Professor
Munehiro Fukuda received a B.S. from the College of Information Sciences and an M.S. from the Master's Program in Science and Engineering at the University of Tsukuba in 1986 and 1988. He received his M.S. and Ph.D. in Information and Computer Science at the University of California at Irvine in 1995 and 1997, respectively. He has worked in the hardware development of shared-memory multiprocessors at IBM Tokyo Research Laboratory from 1998 to 1993. During his Ph.D. and PostDoc study at UC Irvine from 1993 to 1997, he has focused on software technologies to coordinate parallel and distributed computations, using a navigational autonomy approach. During 1998-2001, he was an Assistant Professor in the Institute of Information Sciences and Electronics at the University of Tsukuba, where he has designed the M++ self-migrating threads to realize

parallel execution of multi-agent applications. His research interests include mobile agents, multi-threading, cluster computing, grid computing and distributed simulations.

Charles F. Jackels,
Professor and Director
Dr. Jackels is a graduate of the University of Washington where he earned a Ph.D. in physical chemistry.
His research interests are in the application of computational techniques to interesting problems in physical chemistry. Recent studies have included the vibrational spectrum of ethanol, the photochemistry of the chlorine monoxide dimer, which is important in stratosperic ozone depletion, and the use of curvilinear coordinates in calculating rates of very large scale Fortran codes running on Unix workstations or supercomputers. From a code development point of view, some of the most interesting challenges involve implementation of these codes on parallel architectures. Dr. Jackels in willing to consider serving as a mentor to a broad range of student internships in areas related to computer application in science or engineering. This could include data visualization, PC or Unix based application development, scientific database management, instrument control, simulation development, etc.

Mark Kochanski
Senior Lecturer
Mark Kochanski is a graduate of Purdue University where he studied both geology and computer sciences leading up to an M.S. in Economic Geology with a computer application-based thesis in 1984. Mark started working in the computing industry during high school in the mid 70s. From the mid 80s through early 90s,Mark worked in the petroleum industry developing application, enterprise, and industry-wide data models, databases, and user-friendly, data-oriented applications. In 1993, Mark started his successful independent consulting company, Albion Technology, which has provided technology expertise and IT support to a variety of business and organizations. In Mark's 25+ years in the computing field, he has provided computing expertise for a variety of companies from Exxon to startups, educational institutions, non-profit organizations, and the U.S. Government; worked in a variety of computing environments from palm to mainframe and from standalone to massively distributed; developed from device drivers, database engines, and middleware, to business and technical/scientific applications. Mark's industry background and on-going experience with clients reinforces Mark's desire to help train quality software developers who can grow into technical leads, software architects, and beyond. Mark's technical interests includes anything database, user-friendly applications, component-based systems, XML, and other technologies that lead to creative solutions to difficult real-world problems.

Alan Leong
Lecturer
Alan Leong received his M.S.E. from the University of Washington in Industrial Engineering. Mr. Leong is a technology management consultant and partner in The Redmond Group (a consulting group that trains project groups in the best practices for high tech product development). He is also an advisory board member for various high

tech startups in the Puget Sound area. Mr. Leong is an adjunct faculty member at the University of Washington, Bothell for the Business and Computing & Software Systems programs. His academic and applied research has focused on cross-functional product development teams.

Clark Olson
Associate Professor
Clark Olson received the B.S. degree in computer engineering in 1989 and the M.S. degree in electrical engineering in 1990, both from the University of Washington, Seattle. He received the Ph.D. degree in computer science in 1994 from the University of California, Berkeley. After spending two years doing research at Cornell University, he moved to the Jet Propulsion Laboratory, where he spent five years working on computer vision techniques for Mars rovers and other applications. Dr. Olson joined the faculty at the University of Washington, Bothell in 2001. His research interests include computer vision and mobile robotics. He teaches classes on the mathematical principles of computing and database systems, and he continues to work with NASA/JPL on mapping and localization techniques for Mars rovers.

John R. Rassmussen
Senior Lecturer
Dr. Rasmussen is most interested in applications of mathematics to the real world. He welcomes the challenge of sharing his mathematical knowledge, and real life work experience with students who may have found previous mathematics courses to be dull, hard, theoretical, or generally a negative experience. As a faculty member at Gonzaga University, Bowdoin College, and UWB, Dr. Rasmussen has taught courses on calculus, probability, statistics, finance, linear programming, operations research, graph theory, mathematical logic, business mathematics, and mathematics for the liberal arts. Dr. Rasmussen enjoys combining his 14 years of experience in banking to enhance the courses he teaches. A good example of this combination of real life experience and mathematical knowledge was his development and teaching of the finance module for the award winning UW Extension course on Commercial Real Estate.

Michael Stiber
Associate Professor
Dr. Stiber received a BS in Computer Science and a BS in Electrical Engineering from Washington University, Saint Louis, in 1983, and his MS and PhD in Computer Science from the University of California, Los Angeles, where he was a Research and a Teaching Assistant. He has held positions with Texas Instruments (Dallas, Texas), Philips (Eindhoven, Netherlands), and the IBM Los Angeles Scientific Center. He was an Assistant Professor in the Department of Computer Science at the Hong Kong University of Science & Technology during 1992-96 and a Research Assistant Professor in the Department of Molecular and Cell Biology at the University of California, Berkeley in 1996-97. Dr. Stiber is a frequent visitor to the Department of Biophysical Engineering at Osaka University (Japan). His research interests include: scientific data management and visualization, computational neuroscience, biocomputing, neuroinformatics, simulation,

scientific computing, neural networks, autonomous systems, computer graphics, computer vision, nonlinear dynamics, and complex systems.

Dr. Stiber is on the executive committee of the Seattle chapter of the IEEE Computer Society, has served on organizing committees, chaired sessions, and reviewed papers for neural network and computational neuroscience conferences, and is a reviewer for Physica D, The Journal of Computational Neuroscience, and the Bulletin of Mathematical Biology.

Kelvin Sung
Associate Professor
Dr. Kelvin Sung received his Ph.D. in Computer Science at the University of Illinois at Urbana-Champaign in 1992. His background is in computer graphics, hardware and machine architecture. He came to UW Bothell from Alias|Wavefront in Toronto, where he played a key role in designing and implementing the Maya Renderer, a new generation image synthesis system. He also co-designed a patented motion blur algorithm. Images generated based on that algorithm can be found in movies including Independence Day and Wing Commander. Before joining Alias|Wavefront, Kelvin was an Assistant Professor with the School of Computing, National University of Singapore. Kelvin's research interests are in studying the role of technology in supporting human communication. Currently he is studying how different media delivered by technology can better support the presentation of ideas.

Carol Zander
Senior Lecturer
Dr. Zander received an M.S. degree in mathematics from the University of Colorado and a M.S. and Ph.D. in computer science from Colorado State University. She has worked in the software industry at Hewlett-Packard and IBM, and her many interests include object-oriented programming and design, programming languages, distributed artificial intelligence, and software engineering education. She has spent many years shaping the minds of students, teaching mathematics and computer science at the University of Maine, Colorado State University, and Seattle University. At Seattle University her students rewarded her efforts by voting her outstanding faculty awards.

Appendix C: BA AC Course Descriptions

CSS 105 Interdisciplinary Information Technology (5)
Excursions into the characteristics, organization, and use of computers and computing. Designed for non-CSS majors. Topics vary, addressing social, scientific, ethical, and business underpinnings and implications of information technology. Explores applications used in problem solving. Does not count credit toward the CSS degree or CSS minor.

CSS 161 Fundamentals of Computing (5)
Introduction to programming concepts within social, cultural, scientific, mathematical, and technological concepts. Topics include programming fundamentals (control structures, data types and representation, operations, functions and parameters), computer organization, algorithmic thinking, introductory software engineering concepts (specifications, design, testing), and social and professional issues (history, ethics, applications).

CSS 162 Programming Methodology (5)
Transition from basic programming skills to a rigorous process of software development. Familiarization with higher level programming techniques (recursion, generic programming) and constructs (object-orientation, lists, stacks, queues, searching, sorting). Emphasizes connection between mathematical/algorithmic thought (logic, sets, functions, number bases) and implementation. Prerequisite: minimum grade of 2.0 in CSS 161.

CSS 225 Physics and Chemistry of Computer Components and Their Manufacture (5)
Examination of the basic physics and chemistry underlying the design and manufacture of computer components. Introduction to the electronic structure of the solid state, the nature of p-n junctions, and basic transistor design. Aspects of materials and polymer science and photolithography employed in microchip manufacture. May not be repeated.

CSS 263 Programming and Discrete Mathematics (5)
Abstract representation as tools for software design. Fundamentals of mathematical thinking (predicate calculus, functions, relations, proofs, computational complexity) applied to abstract data types (lists, stacks) queues) and algorithmic strategies (divide-and-conquer, greedy). Pointers and memory management in programming languages. Prerequisite: minimum grade of 2.0 in both CSS 162 and B CUSP 124.

CSS 301 Technical Writing for Computing Professionals (5)
Explores methods for writing effective system specifications, user documentation and requests for proposals (RFPs). Examines RFP analysis techniques, writing plans, proposals, marketing documentation, and customer communications. May not be repeated.

CSS 330 Topics in Mathematics for Software Development (1-5, max. 10)
Topics in intermediate mathematics as applied within the context of computer software

application development. Topics chosen from the fields of intermediate calculus and finite mathematics.

CSS 332 Programming Issues with Object-Oriented Languages (2)
Covers language and development/execution environment differences, including data types, control structures, arrays, and I/O; addressing and memory management issues including pointers, references, functions, and their passing conventions; object-oriented design specifics related to structured data and classes. Co-requisite: CSS 342

CSS 341 Fundamentals of Programming Theory and Applications (5)
Fundamental concepts and techniques for analysis, design and implementation of computer programming. May not be repeated.

CSS 342 Mathematical Principles of Computing (5)
Integrating mathematical principles with detailed instruction in computer programming. Explores mathematical reasoning and discrete structures through object-oriented programming. Includes algorithm analysis, basic abstract data types, and data structures. May not be repeated.

CSS 343 Data Structures and Algorithms (5)
Develops competencies associated with problem-solving, algorithms and computational models. Covers abstract data types and data structures, efficiency of algorithms, binary tree representations and traversals, searching (dictionaries, priority queues, hashing), directed graphs and graph algorithms, language grammars. Prerequisite: 2.0 in CSS 301; 2.0 in CSS 342; may not be repeated.

CSS 350 Management Principles for Computing Professionals (5)
Through a team software project, explores critical interpersonal, communication, leadership, decision-making, social, and cultural theories drawn from contemporary research in anthropology, sociology, psychology, and business. Prerequisite: CSS 301, which may be taken concurrently; may not be repeated.

CSS 360 Software Engineering (5)
Surveys the software engineering processes, tools, and techniques used in software development and quality assurance. Topics include life-cycle models, process modeling, requirements analysis and specification techniques, quality assurance techniques, verification and validation, testing, project planning, and management. Prerequisite: CSS 301 which may be taken concurrently; either CSS 341 or CSS 342 which may be taken concurrently; may not be repeated.

CSS 370 Analysis and Design (5)
Methods and tools to capture and communicate requirements, proposed solutions, and design to management, customers, and software developers. Data, process, and object modeling using languages such as data flow diagrams, entity/relationship diagrams, and unified modeling language use cases and class and sequence diagrams. Prerequisite: 2.0 in CSS 301; 2.0 in CSS 342; 2.0 in CSS 360; may not be repeated.

CSS 371 The Business of Computing (5)
Methods for aiding software development, communicating progress to customers/management, and developing marketing strategies for the product. Incorporates social, psychological, and ethical issues. May not be repeated.
CSS 390 Special Topics (1-5, max. 10)
Examines current topics and issues associated with computing and software systems.

CSS 390 Special Topics (1-5, max. 10)
Examines current topics and issues associated with computing and software systems.

CSS 421 Hardware Architecture and Operating Systems (5)
An introduction to hardware architecture of modern microprocessors and operating systems. Provides student with basic theories and concepts of how hardware and software interact. Topics covered include instruction set architecture, memory and I/O organization, task management, memory management, file systems and interrupt handing. The differences between CISC and RISC architectures will be examined in the context of their register organization, memory addressing modes, and instruction set organization. Prerequisite: CSS 342

CSS 422 Hardware and Computer Organization (5)
An introduction to the architecture, operation, and organization of a modern computing machine. Topics covered include basic logic operations, state-machines, register models, memory organization, peripherals, and system issues. Assembly language taught in order to understand the instruction set architecture and memory model of the computer. Prerequisite: CSS 301; CSS 342; may not be repeated.

CSS 427 Introduction to Embedded Systems (5)
Introduction to the process of specifying, designing, and testing embedded systems. Follows the embedded systems development. Covers software and hardware partitioning, processor selection, real-time operating systems, embedded software design in assembly language and C, debugging, and testing. Prerequisite: CSS 422; may not be repeated.

CSS 428 Embedded Systems Laboratory (3)
Principles and development of embedded software for real-time applications using C, C++, and assembly language. Topics include file format, using an Integrated Design Environment, logic analysis, in-circuit emulation tools, interrupt-driven programming applications, measuring cache performance, FLASH algorithms and analog to digital conversion. Prerequisite: CSS 422.

CSS 430 Operating Systems (5)
Principles of operating systems, including process management, memory management, auxiliary storage management, and resource allocation. Focus on the structure of the popular desktop and real-time operating systems. Prerequisite: CSS 343; may not be repeated.

CSS 432 Network Design (5)
Examines methods for designing LANs and WANs that optimize Quality of Service (QoS). Covers theoretical and practical element of the OSI protocol stack; routing protocols including OSPF and BGP; networking management/architecture; router configuration; security; and Internet policies. Explores emerging networking technologies. Prerequisite: CSS 301; CSS 422; may not be repeated.

CSS 434 Parallel and Distributed Computing (5)
Concepts and design of parallel and distributed computing systems. Topics include: fundamentals of OS, network and MP systems; message passing; remote procedure calls; process migration and mobile agents; distributed synchronization; distributed shared memory; distributed file system; fault tolerance; and grid computing. Prerequisite: CSS 343.

CSS 442 Object-Oriented Programming and Design (5)
Topics include advanced programming methodologies for PC/workstation-based GUI applications and object-oriented modeling, programming, and design. Study and design applications in a large-scale team environment. Introduce design patterns. Prerequisite: CSS 343; CSS 370; may not be repeated.

CSS 443 Advanced Programming Methodologies (5)
Examines programming methodologies, both theoretical and practical application aspects. From a theoretical aspect, explores approaches to analyzing and designing algorithms. In relation to practical applications, studies thread-based distributed application development. Prerequisite: CSS 343; may not be repeated.

CSS 448 Translation of Programming Languages (5)
Introduction to the structures and organization of programming languages; fundamentals of translation; regular expressions and context-free grammars; syntax and lexical analysis, symbol tables, semantics and parsing, code generation; translation techniques such as LR, LL, and recursive descent. Prerequisite: CSS 343; may not be repeated.

CSS 450 Computer Graphics (5)
Introduces the hardware devices, reviews the mathematics, and discusses the algorithms of computer graphics in 2-D space. Discusses basic computer graphics terminology, concepts, algorithms, and how to design and implement 2-D interactive computer graphics-related programs. Prerequisite: CSS 343; may not be repeated.

CSS 451 3-D Computer Graphics (5)
Introduces practical and popular three-dimensional (3-D) graphic algorithms. Examines modeling (how to build 3-D objects), animation (how to describe the motion of objects), and rendering (how to generate images of 3-D objects in animation). Prerequisite: CSS 450; may not be repeated.

CSS 455 Introduction to Computational Science and Scientific Programming (5)
Introduction to principles and fundamental algorithms of scientific computing, including

applied linear algebra and numerical methods. Group projects address current computational problems in the physical, biological, and life sciences. Prerequisite: either CSS 341 or CSS 342 which may be taken concurrently; may not be repeated.

CSS 457 Multimedia and Signal Computing (5)
How multimedia information is captured, represented, processed, communicated, and stored in computers. Topics include: physical properties of sound and images, digitization, digital signal processing, filtering, compression, JPEG and MPEG algorithms, and storage and network communication. Prerequisite: CSS 342; may not be repeated.

CSS 458 Fundamentals of Computer Simulation Theory and Application (5)
Covers all aspects of computer simulation including theory, implementation, and application. Presents real-life interdisciplinary examples. Final student project models a real-life situation with a computer simulation. Prerequisite: CSS 342; may not be repeated; recommended: statistics.

CSS 461 Software Project Management (5)
Fundamental skills required for effective software project management, including project planning and tracking and people management. Topics include risk analysis, project scope, scheduling, resource allocation, cost estimation, negotiation, monitoring and controlling schedule, software metrics, quality management, process improvement, staffing, leadership, motivation, and team building. Prerequisite: CSS 360; may not be repeated.

CSS 475 Database Systems (5)
Methods for obtaining requirements and designing database systems; differences between hierarchical, relational, and network database designs; techniques for designing and coding effective reporting procedures. Prerequisite: either CSS 341 or CSS 342; CSS 360; may not be repeated.

CSS 478 Usability and User-Centered Design (5)
Application of human information processing models, theories and human-computer interaction principles for designing interactive systems. Emphasis is on how usability methods could be incorporated into the system design lifecycle. Topics include user survey, heuristic evaluation, task analysis and experimental testing. Prerequisite: CSS 360; may not be repeated.

CSS 480 Principles of Human-Computer Interaction (5)
Examines fundamentals of human perception, human cognition, attention and memory constraints; role of user experience and intelligence; input and output devices; standards compliance; design of systems for individual versus collaborative work settings; rapid prototyping, user-centered design techniques, and design evaluation methods. Prerequisite: CSS 360; may not be repeated.

CSS 482 Expert Systems (5)

Theory and application of expert systems: computer systems that capture and use human expertise. Applications include computer configuration, fault diagnosis, computer-aided instruction, data interpretation, planning and prediction, and process control. Prerequisite: CSS 343; may not be repeated.

CSS 485 Introduction to Artificial Neural Networks (5)
Application of biological computing principles to machine problem solving. State of the art in artificial neural networks (ANNs), including vision, motor control, learning, data analysis. Topics include ANN architectures, algorithms: perceptrons, Widrow-Hoff, backpropagation, Hebbian networks. Prerequisite: CSS 343; may not be repeated; recommended: prior exposure to linear algebra, probability, and calculus.

CSS 487 Computer Vision (5)
Methods for extracting content from digital images. Topics typically include linear filters, edge detection, segmentation, stereo vision, motion estimation, and object recognition: Examines applications of computer vision, such as image databases and robot navigation. Prerequisite: CSS 343.

CSS 490 Special Topics in Computing and Software Systems (1-5, max. 20)
Examines current topics and issues associated with computing and software systems. Offered: AWSpS.

CSS 496 Senior Seminar and Capstone Research (5)
Participate in a group seminar and produce a report describing a development, survey, or small research project in applied computing in an application to another field. Objectives are: (1) integrating material from a minor or concentration, (2) introducing the professional literature, (3) gaining experience in writing a technical document, and (4) showing evidence of independent work in a domain area. Prerequisite: CSS 350, CSS 360, CSS 421; three additional courses in the minor or concentration area.

CSS 497 Cooperative Education (1-10-, max. 10)
Completion of project as delineated in a contract between student, faculty advisor, and community sponsor. Prerequisite: CSS 350; CSS 370; CSS 422; CSS 430; two additional CSS courses.

CSS 498 Independent Study (1-5, max. 10)
Individual study by arrangement with instructor.

CSS 499 Undergraduate Research (1-5, max. 10)
Design and implementation of a research study as specified in a contract with a faculty member.

Appendix D: Letters of Support

Note: Copies of the following expected letters will be included in the final report.

* Bellevue Business Roundtable (Multiple endorsements across disciplines)
* Bellevue CC President; Cascadia CC President; Edmonds CC President
* Representative John McCoy (House Representative; General Manager QuilCeda Village/Tulalip Tribes; Puget Sound Executive of the Year – 2005)
* Senator Rosemarie MacAuliffe
* Chair UWB Citizens Advisory Board
* Boeing (Pamela Drew)
* Northeast Tech Prep Consortium (Joyce Carroll, Director)
* San Juan software (Tim Gillman, Vice President)
* Datalight (Roy Sherrill, President)

Other CC presidents (from Chancellors office…)

UW
UNIVERSITY OF WASHINGTON

BOTHELL

Office of the General Faculty Organization

To: Faculty Council on Tri-Campus Policy

From: Mike Stiber, Chair, Executive Council of the General Faculty Organization, University of Washington Bothell

Date: 28 February 2007

Re: Executive Council Approval of the Proposed BA in Applied Computing for the Computing and Software Program

The Executive Council (EC) of the General Faculty Organization of University of Washington Bothell reviewed the responses from the tri-campus review of the proposal for a new BA in Applied Computing at its February 28 meeting. The EC has determined that the proposing faculty in the Computing and Software Systems program have duly considered and responded to the comments posted by faculty from across the three campuses during the tri-campus review period. A letter containing the responses is attached with the checklist. The EC furthermore voted to approve the BA in Applied Computing proposal.

Please let me know if you need any additional information.

Memorandum

To: Professor Michael Stiber, Chair
Executive Committee of the General Faculty Organization
University of Washington Bothell

From: Charles F. Jackels, Director
Computing and Software Systems Program
University of Washington Bothell

Date: February 16, 2007

Re: Response to Tri-Campus Review Comments on the proposed
Bachelor of Arts in Applied Computing Degree

The Computing and Software Systems Program appreciates the opportunity to reply to the thoughtful comment (attached) that was posted during the tri-campus review process of the proposed Bachelor of Arts in Applied Computing (BA in AC) degree.

We agree with the reviewer that computer science requires a great deal of logic and that calculus courses can be effective in its development. We have thoughtfully considered how much calculus to require and have concluded that a single rigorous course in differential calculus is a suitable *minimum* level of preparation.

This conclusion arises in large part from analysis of the performance of our present BS in CSS students. CSS 343, Data Structures and Algorithms, is the intermediate programming course that poses the greatest challenge to our present BS students. The performance of these students in the prerequisite calculus-1 and -2 courses is in fact a good predictor of their eventual success. The proposed degree, with a much broader focus than traditional computer science, requires either CSS 342 or CSS 263, but does *not go on* to require CSS 343. We believe a single rigorous course in differential calculus will provide the background needed for success in CSS 342/CSS 263 and in the other computer related courses required of the BA student.

We also note that the nature of the BA in Applied Computing degree will depend strongly on the minor or course cluster chosen by each individual student. Minors in more mathematically demanding areas, such as Atmospheric Science, Statistics, or Materials Science and Engineering will themselves require additional mathematics preparation. On the other hand, BA in AC students earning minors in areas such as Business Administration or Education will often find themselves adequately prepared by the first course in calculus. The mathematics preparation will reflect not only the

need of the computer-related curriculum, but also the demands of the student's particular application area.

Finally, as part of the regular evaluation and review of BA in AC curriculum, we will examine the success of our students in light of their mathematics preparation. If those students with the preparation of only a single calculus course experience undue difficulty, we will consider strengthening the prerequisite preparation in mathematics.

Thank you for the opportunity to address this concern. In summary, we expect the proposed mathematics preparation to be adequate for the required computer-related courses, but will be prepared to make a curriculum adjustment if student success indicates that to be advisable.

Submitted by Hung Dang.

Below is the proposal for pre-major admission evaluation. Let me know your thoughts.

All pre-major status applicants meeting the criteria below would be admitted by Student Affairs.

*   45 transferable college credits
*   Satisfied all University minimum admissions core requirements
*   2.75 cummulative college gpa
*   2.75 gpa in college English composition course
*   2.50 gpa in college Quantitative Symbolic Reasoning course

Applicants not meeting any criteria listed above would be forwarded for holistic review. The same freshman holistic review sheet would be used with the exception of "standardize test". The standardize test is not used as part of the HR review because we don't require transfer applicants to submit ACT/SAT score. Applicants with acceptable HR score would be admitted. Applicants that fall below the desirable HR score would then forwarded to Student Relations Committee for final consultation. EC or Student Relations Committee will need to designate the desireable HR score.

I think this is a good base for our conversation about this subject. Let me know if you have any questions.

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Bothell Bachelor of Arts in Applied Computing (CSS-20070112)

Tri-Campus Review Comments

Comment by ellen wijsman made 1/18/2007 6:13:42 PM
I think it is a mistake to ease up so much on the mathematics prerequisites. Computer science and computer programming requires a great deal of logic, and I suspect that by dropping the extra calculus requirements, you will select for students who do not want to develop those skills as much as is needed.

UNIVERSITY CAMPUSES UNDERGRADUATE PROGRAM REVIEW PROCEDURES**

CHECKLIST

Title of Proposal: Bachelor of Arts in Applied Computing

Proposed by (unit name): Computing and Software Systems

Originating Campus:

___UW, Seattle

_X_UW, Bothell

___UW, Tacoma

I. **Phase I. Developed Proposal Review** (to be completed by Originating Campus' Academic Program Review body)

    A. Review Completed by: Executive Council of the General Faculty Organization

      Chaired by: Professor Mike Stiber

      12/04/06 Date proposal received by originating campus's review body

      01/17/07 Date proposal sent to University Registrar

      01/19/07 Date proposal posted & email sent to standard notification list

      02/28/07 Date of originating campus's curriculum body approval
            (Note: this date must be 15 business days or more following date of posting)

    B. __1___ Number of comments received. Attach the comments and a summary of the

consideration and responses thereof : (1-2 paragraphs)

II. **Phase II. Final Proposal Review** (to be completed by FCTCP)

    A. Review Completed by:
      ___ FCTCP subcommittee
      _x_ FCTCP full council
      Chaired by: Killien, Marcia

      3/12/07 Date request for review received from University Registrar
      3/29/07 Date of FCTCP report

    B. Review (attached)

YES NO

_x__ ___ Was notice of proposal posted on UW Website for 15 business days?

_x___ ___ Was notice of proposal sent to standard mailing list 15 business days in advance of academic program review?

_x___ ___ Were comments received by academic program review body?

_x___ ___ Was response to comments appropriate? (explain, if necessary)

_x_ ___ Was final proposal reviewed by FCTCP within 14 business days of receipt?

_x___ ___ Was there adherence to the University Campuses Undergraduate Program Review Process? (explain, if necessary)

**Endorsed by Faculty Senate Executive Committee, 1/10/05, modified 1/31/06; These procedures apply to new undergraduate degrees, majors, minors (and certificates) and substantive changes to same

Bill Grinstein
Chair

Ann Daley
Executive Director

STATE OF WASHINGTON
HIGHER EDUCATION COORDINATING BOARD
917 Lakeridge Way SW • PO Box 43430 • Olympia, WA 98504-3430 •(360) 753-7800 • FAX (360) 753-7808 • www.hecb.wa.gov

RESOLUTION NO. 07-14

WHEREAS, the University of Washington Bothell proposes to offer a Bachelor of Arts in Applied Computing;

WHEREAS, the program would support the role and mission of the institution by offering innovative and creative curricula to meet the regional demand for technology workers in a growing and competitive job market;

WHEREAS, the program would respond to demonstrated student, employer, and community needs, consistent with the state and regional needs assessment conducted by the HECB and the university's own assessment of need;

WHEREAS, the program targeting and recruitment plan is well-defined and builds on existing programs at the university;

WHEREAS, the costs are reasonable; and

THEREFORE, BE IT RESOLVED, that the Higher Education Coordinating Board approves the Bachelor of Arts in Applied Computing at the University of Washington Bothell.

Adopted:

July 26, 2007

Attest:

_____
Bill Grinstein, Chair

_____
Betti Sheldon, Vice-Chair