THE UNIVERSITY OF WISCONSIN-MILWAUKEE
College of Engineering and Applied Science

F A C U L T Y   M E E T I N G

Friday, January 27, 2017   1:30 p.m.   EMS E180

M I N U T E S

The meeting was called to order at 1:37 p.m. with Associate Dean Adel Nasiri presiding. Forty members were present:

EXCUSED: Professors Li, Misra, Petering, Peters, Pillai, Renken, Rohatgi, Venugopalan, L.Wang, W.Wang, J.Yu

ABSENT: Professors Amano, Liao, Liu, Lopez, Otieno, Pashaie, Qin, Sung

GUESTS: T. Johnson

I.   ANNOUNCEMENTS

A.   Prof. Changsoo Kim was inducted into the Millionaire's Club.

B.   E. Munson described the new format for proctoring the Ph.D. Qualifying Exam. To reduce distractions, a mix of faculty, staff, and graduate students will be in the exam room as proctors, while faculty will be nearby to answer questions.

C.   E. Munson reminded faculty that a student is not officially admitted to the graduate program until after the Graduate School has informed the student. The department decisions are advisory in nature, and while they usually are followed by the Graduate School, faculty should not assume that the students will be officially accepted until the Graduate School has acted.

II.   INFORMAL REPORTS – See Attachment 1

A.   Todd Johnson was asked for an update on enrollment, and he responded that the numbers for this semester are not yet final, but appear to be down ~2% in both headcount and credit hours from last spring.

III. AUTOMATIC CONSENT BUSINESS

A. New Courses and Course Modifications – See Attachment 2

B. Minutes of the November 18, 2016 meeting

IV. *NEW BUSINESS*

A. Creation of a Curricular Code for Applied Computing – See Attachment 3

Prof. Church moved to approve the request to create a curricular code *CEAS*
Applied Computing. *DOC. NO. 246*

The motion passed on a voice vote.

B. Request to implement a collaborative online B.S. degree in Applied *CEAS*
Computing – See Attachment 4 *DOC. NO. 247*

Prof. Church moved to approve the request to implement the
proposed collaborative online B.S. degree in Applied Computing.

The motion passed on a voice vote.

C. Ph.D. Qualifying Exam Guidelines – See Attachment 5

After some discussion, but without having anyone moved adoption of
the proposed guidelines, the document was referred to the GPSC for
their consideration of including previously-approved guidelines regarding
a student failing the exam twice.

V. *GENERAL GOOD AND WELFARE*

Associate Dean Nasiri gave a presentation on the research initiatives and activities in CEAS.

VII. *ADJOURNMENT*

Meeting Adjourned at 2:39 p.m.

John R. Reisel, Secretary
CEAS Faculty

JRR
Attachments

INFORMAL REPORTS

Office of Student Services – Todd Johnson
No Report

Career Services – Juli Pickering
1) Call for Volunteers: FIRST Tech Challenge
Volunteers are needed to assist at Wisconsin's FIRST Tech Challenge state championship, UWM Student Union, Feb. 3, 1-7 p.m. and Feb. 4, 7 a.m.-5:30 p.m. To volunteer, contact Juli Pickering, at jlpicker@uwm.edu.

2) Save the Date: Spring Industry Expo

The Spring Industry Expo will be held on Friday, February 24th, from 10 a.m.-2 p.m., in the Wisconsin Room of the Student Union.

Industry Expo is an excellent opportunity to talk with employers who employ our students and alumni. Many companies will have CEAS alumni as representatives at the event.

Curriculum Committee – Prof. Church
No Report

Graduate Program Subcommittee – Prof. Lopez
No Report

Academic Planning Committee – Prof. Misra

1) APC recommended to Dean Peters that the revised version of the Expectations of Chairpersons be taken to the CEAS faculty for their consideration and adoption.

2) Dean Peters updated the APC about the deficit in campus-wide marginal tuition and its potential implications on our faculty recruitment plans.

3) Program assessment strategies and related issues were discussed and the working draft was updated. Further discussions are expected to continue in spring semester.

4) Next meeting of the APC is scheduled on January 20, 2017.

Biomedical and Health Informatics – Prof. McRoy
No Report

Graduate Faculty Committee – Prof. Hosseini
No Report

Faculty Senate – Prof. Reisel

The Faculty Senate met on December 15, and had a lengthy discussion on a resolution seeking to make UWM a sanctuary campus. The Senate met again on January 26, where the main item on the agenda was Chancellor Mone's Spring Plenary address.

NEW COURSES

APC 300	PROGRAMMING 1, 3 cr., U Introduction to history of computing, fundamental computer concepts and structured programming techniques. Prereq: none.
APC 310	MATH FOR COMPUTER SCIENCE, 3 cr., U Important foundational topics in computer science. Prereq: none.
APC 320	INTRODUCTION TO BUSINESS, 3 cr., U Introduction to the major functional areas of business including the roles of accounting, finance, human resources, marketing, information systems, and operations in the organization. Prereq: none.
APC 330	TECHNICAL AND PROFESSIONAL COMMUNICATION, 3 cr., U Technical and professional communication skills and techniques. Practice in creating effective memos and reports, developing technical material, delivering presentations, and developing communication within teams. Prereq: None
APC 340	LEGAL AND ETHICAL RESPONSIBILITIES OF THE IT PROFESSIONAL, 3 cr. ,U Legal, regulatory, ethical and compliance issues associated with developing software and using information systems in an organization. Prereq: admis to BS-APC prog; APC 320(P).
APC 350	PROGRAMMING 2, 3 cr., U Continuation of fundamental computer concepts and Programming. Prereq: APC 300(P); 310(P).
APC 360	DATABASE MANAGEMENT 1, 3 cr., U Design and implementation of relational database management systems to support computer-based information systems. Prereq: admis to BS-APC prog; APC 300(P); 310(P).
APC 370	SYSTEM ANALYSIS AND DESIGN, 3 cr., U The five phases of Systems Development Life Cycle: scope definition, problem analysis, requirements analysis, logical design and decision analysis. Prereq: admis to BS-APC prog; APC 300(P); 320(P); 330(P).
APC 380	PROJECT MANAGEMENT TECHNIQUES, 3 cr., U An introduction to project management techniques including project selection and life cycle, stakeholder/scopequality/procurement management, budget control, scheduling, risk identification. Prereq: admis to BS-APC prog; APC 370(P).

APC 390   OBJECT ORIENTED PROGRAMMING, 3 cr., U
An introduction to Object-Oriented Programming techniques using the Java
programming language.
Prereq: APC 350(P)

APC 400   APPLIED COMMUNICATION NETWORKS, 3 cr., U
Fundamental concepts in the design, configuration, and problem solving of
computer networks.
Prereq: admis to BS-APC prog; APC 350(P).

APC 410   DATABASE MANAGEMENT 2, 3 cr. U
Architecture and use-cases of non-relational (NoSQL) based on four types of
databases including document, Graph, Key-value, and wide column store.
Prereq: admis to BS-APC prog; APC 360(P).

APC 420   COMPUTER SECURITY 1, 3 cr., U
Security and risk management, security engineering, identity and access
management, and security operations.
Prereq: APC 350(P).

APC 430   APPLIED DATA STRUCTURES AND ALGORITHMS, 3 cr., U
Concepts and the application of data structures and algorithms.
Prereq: APC 390(P).

APC 440   WEB DEVELOPMENT, 3 cr., U
Creating advanced and interactive websites web sites using technologies like
HTML 5, CSS, JavaScript, Bootstrap, XML, web services, and database
integration within the ASP.Net platform.
Prereq: APC 360(P); 400(P).

APC 450   OPERATING SYSTEMS THEORY AND PRACTICE, 3 cr., U
An introduction to important operating systems concepts such as processes,
threads, scheduling, concurrency control and memory management.
Prereq: admis to BS-APC prog; APC 430(C).

APC 460   SOFTWARE ENGINEERING, 3 cr., U
Basic software development methodologies and tools, including the waterfall,
iterative, and agile approaches.
Prereq: APC 370(P); 390(P).

APC 470   IS STRATEGY AND MANAGEMENT, 3 cr., U
Organizational/IS strategy using a capability maturity model for topics such as
budgeting, acquisition, service/change/personnel management.
Prereq: admis to BS-APC prog; APC 380(P); 460(C).

APC 480   COMPUTER SECURITY 2, 3 cr., U
Communication and network security, security assessment and testing, software
development security, and asset security.
Prereq: APC 360(P); 400(P); 420(P); 450(P).

APC 490   CAPSTONE PROJECT PREPARATION, 1 cr., U
                   Student capstone project and creation of initial plan with specific deliverables
                   identified.
                   Prereq: admis to BS-APC prog; APC 460(C).

APC 495   CAPSTONE PROJECT, 3 cr., U
                   Development, management and delivery of an applied computer science project
                   for a client, including communication of project requirements and status to a non-
                   technical audience.
                   Prereq: admis to BS-APC prog; APC 490(P).

COMPSCI 318   TOPICS IN DISCRETE MATHEMATICS, 3 cr., U
                   Number theory topics related to cryptography; discrete structures including
                   graphs, partial orders, Latin squares and block designs; advanced counting
                   techniques
                   Prereq: a grade of C or better in CompSci 317(P) or Math 341(P).

COURSE CHANGES

COMPSCI 595   CAPSTONE PROJECT, 4 cr. U
                   Students will integrate their knowledge of the undergraduate computer science
                   curriculum by implementing a significant computer science team project.
                   Prereq: sr st, CompSci 361(P), 458(C), 535(C), 537(C).

                                    had been

COMPSCI 595   CAPSTONE PROJECT, 4 cr. U
                   Students will integrate their knowledge of the undergraduate computer science
                   curriculum by implementing a significant computer science team project.
                   Prereq: sr st, CompSci 361(P), 458(P), 535(P), 537(P) or cons instr.

Creation of a Curricular Code for Applied Computing

Department: Computer Science
Action: New
The University of Wisconsin – Milwaukee

CURRICULAR AREA APPROVAL FORM
School/College: Engineering & Applied Science, Date: 10/24/2016

I. ACTION REQUESTED: Effective date of action requested: Semester Fall 2017
APPROVE NEW CURRICULAR AREA

II. OLD CURRICULAR AREA
Old Curricular Area Title:
Old Curricular Area Abbreviation:

III. NEW CURRICULAR AREA
New Curricular Area Title: Applied Computing
New Curricular Area Abbreviation: APC
UDDS Code: B192520

IV. FOR NEW CODES, PROVIDE DESCRIPTION OF CURRICULAR AREA AND RELATIONSHIP TO ACADEMIC PROGRAMS:
Computer Science and other courses with an applied emphasis

V. REASON FOR CHANGE:
Needed for new collaborative online bachelor's completion program in Applied Computing.

VI. OTHER DEPARTMENTS AND CURRICULAR AREAS THAT MAY BE AFFECTED:
COMPSCI COMPST INFOST -- SOIS BUSADM – LUBAR

VII. APPROVAL:
Chair, School/College Curriculum Committee _____ _____
Chair, Academic Program and Curriculum Committee _____ _____
Chair, Graduate Course and Curriculum Committee _____ _____
Dean, School/College: _____ _____
Provost: _____ _____

**REQUEST FOR AUTHORIZATION TO IMPLEMENT A
COLLABORATIVE ONLINE
BACHELOR OF SCIENCE DEGREE IN APPLIED COMPUTING**

**University of Wisconsin-Milwaukee
University of Wisconsin-Oshkosh
University of Wisconsin-Platteville
University of Wisconsin-River Falls
University of Wisconsin-Stevens Point**

With administrative and financial support from the University of Wisconsin-Extension

ABSTRACT

The University of Wisconsin-Extension, on behalf of the above-defined academic partners, proposes to establish an online *Bachelor of Science in Applied Computing (B.S. in Applied Computing)*. This degree-completion program offers a balance of theoretical and applied computing coursework to prepare students for multiple pathways into the information technology workforce. The program features a multidisciplinary curriculum that draws primarily from computer science, business, information systems, math and statistics, and communication. Graduates will emerge from the program armed with the technical proficiency, project management skills, communication expertise, and analytical skills needed to develop innovative solutions to technology challenges. Applied computing uses aspects of computer science to solve problems in various disciplines, including politics, business, education and the environment. Working in this field, students will use a range of programming, software engineering, graphic applications, networking and operating systems management skills to collect, analyze, store and distribute information that will help resolve issues for individuals, groups and companies.

PROGRAM IDENTIFICATION

Institution Names
University of Wisconsin-Milwaukee
University of Wisconsin-Oshkosh
University of Wisconsin-Platteville
University of Wisconsin-River Falls
University of Wisconsin-Stevens Point

Title of Proposed Program
Bachelor of Science in Applied Computing

Degree/Major Designations
Bachelor of Science/Applied Computing

Mode of Delivery
Collaborative online degree program

Projected Enrollments by Year Five
Table 1 represents enrollment and graduation projections for students entering the program over the next five years and is based, in part, on experience with comparable University of Wisconsin collaborative online programs. As shown, we are anticipating strong enrollments with 285 students enrolling in the

program and 40 students having graduated from the program by the end of year five. For the purpose of this model, it is anticipated that the annual attrition will be moderate—approximately 20 percent—for students moving through the program.

Table 1: Five-Year Projected Student Enrollments

Students/Year	Year 1	Year 2	Year 3	Year 4	Year 5
New	25	55	65	70	70
Continuing		23	65	100	120
Total	25	78	130	170	190
Graduating	0	0	5	15	20

Tuition Structure
Program tuition for the B.S. in Applied Computing program will be set at $495/credit for 2017–2018 and will be identical at all five partner institutions. This fixed tuition rate is based on projected costs as well as comparisons with other similar online programs in the UW System and nationally, and will be charged outside the credit plateau. This amount represents an all-inclusive fixed tuition, and students will not be charged any additional fees (such as segregated fees) as part of the program, except for the costs of their books. There is no tuition differential for out-of-state students. If students live near their home campus and wish to pay segregated fees for the use of recreational and other facilities, they may do so. However, they will not be required to pay these fees if they do not take advantage of associated resources. This tuition pricing approach and structure follows the current UW System pricing guidelines for distance education programs (ACIS-5.4 Revised: Programming for the Non-Traditional Market in the University of Wisconsin System, APPENDIX C: Principles for Pricing Distance Education Credit Courses, Degree and Certificate Programs).[1]

Department, College, School, or Functional Equivalent
This is a highly collaborative, interdisciplinary program that follows a home campus model (i.e. students identify/select a home campus to receive academic supports and from which the degree is conferred). The departments and schools/colleges that will offer courses for this program at each institution are as follows:
   • At the University of Wisconsin-Milwaukee, the B.S. in Applied Computing degree will be housed in the Department of Computer Science within the College of Engineering and Applied Science.

   • At the University of Wisconsin-Oshkosh, the B.S. in Applied Computing degree will be housed in the Department of Information Systems within the College of Business.

   • At the University of Wisconsin-Platteville, the B.S. in Applied Computing degree will be housed in the Department of Computer Science and Software Engineering in the College of Engineering, Mathematics and Science.

   • At the University of Wisconsin-River Falls, the B.S. in Applied Computing degree will be housed in the Department of Computer Science and Information Systems in the College of Business and Economics.

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[1] University of Wisconsin System (2001). *ACIS-5.4 Revised: Programming for the Non-Traditional Market in the University of Wisconsin System.* Retrieved from http://www.uwsa.edu/acss/acis/acis5.4rev_AppC.htm.

• At the University of Wisconsin-Stevens Point, the B.S. in Applied Computing degree will be housed in the Department of Computing and New Media Technologies within the College of Letters and Science.

UW-Extension Division of Continuing Education, Outreach and E-Learning provides administrative and financial support for the program.

Proposed Date of Implementation
September 2017 pending approval by UW System and the Board of Regents and subsequent approval by the Higher Learning Commission (HLC).

INTRODUCTION

Rationale and Relation to Mission
The online B.S. in Applied Computing degree program contributes directly to the institutional mission of the University of Wisconsin System which clearly defines a commitment to "discover and disseminate knowledge, to extend knowledge and its application beyond the boundaries of its campuses."[2] The B.S. in Applied Computing provides a degree in a recognized high-need area as supported by research that included extensive input from employers throughout the state, and develops competencies that will enable graduates to contribute immediately to serve this important function and role within the Wisconsin workforce. It is a degree targeted at adult and nontraditional students possessing an associate's degree or equivalent credits.

The B.S. in Applied Computing also supports the institutional missions of the five partner campuses by contributing to the core of liberal education by developing communication, critical thinking, problem solving, analytical skills, leadership, teamwork, and collaboration skills. Furthermore, this will be a multidisciplinary degree that helps build bridges between disciplines and develops students' abilities to think in terms of systems and interrelationships, and within complex organizations.

Need as Suggested by Current Student Demand
One of the many recognized and significant benefits of the collaborative program model is the extended reach or scope of contacts provided through the involvement of multiple academic partners located within unique markets throughout the state. Our academic partners have established significant relationships, reputation, and strength-of-brand within their individual regions, which has proven valuable in identifying regional interest in the program and will help raise awareness of this opportunity throughout the state and expand program reach. This will ultimately result in greater success in reaching and serving students, supporting student and regional business needs and interests, promoting program growth, and positioning the program for sustainability.

Similar to other need-based collaborative online programs developed and administered through UW-Extension, the B.S. in Applied Computing represents a program designed to satisfy a recognized workforce gap within the state and region as defined through extensive research to include individual interviews and focus groups representing computer and information technology professionals from diverse industry sectors. Based on input received from these interactions, there is a significant need for professionals in this field who possess practical and applied knowledge and skills in the following areas:
• Current programming languages and technology
• Security

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[2] University of Wisconsin System (2012). *Mission Statements of UW System Institutions*. Retrieved from http://www.wisconsin.edu/about/mission.htm.

- Mobile technology
- Data integration
- Distributed systems
- Communication
- Critical thinking, analysis and problem solving
- Project Management
- Teamwork
- Systems-thinking

Industry representatives also identified that they had a significant number of employees working in direct or supporting computer and information technology related positions who possess two-year technical degrees as well as undergraduate degrees in non-technical areas. All of the industry contacts shared that they would refer employees, as appropriate, to the program, and most identified having some level of tuition reimbursement support available through their organization. It is anticipated that prospective B.S. in Applied Computing students will present with diverse backgrounds and experiences.

Need as Suggested by Current Market Demand
Computer and information technology represents one of the fastest growing fields in the United States. According to the Bureau of Labor Statistics, jobs in this area are projected to grow 12 percent from 2014 to 2024. These occupations are expected to add about 488,500 new jobs, from about 3.9 million jobs to about 4.4 million jobs from 2014 to 2024, in part due to a greater emphasis on cloud computing, the collection and storage of big data, more everyday items becoming connected to the Internet in what is commonly referred to as the "Internet of things," and the continued demand for mobile computing. The median annual wage for computer and information technology occupations nationally was $81,430 in May 2015, which was higher than the median annual wage for all occupations of $36,200.[3] According to PayScale, an online salary database, computing occupations consistently rate as some of the most popular bachelor degrees based on high earning potential, low unemployment rates and a range of career options for graduates.[4]

Typical jobs in this field include, but are not limited to, database developer, web developer, system and network administrator, computer programmer, computer software engineer, computer information system manager, and game designer. Common duties performed by professionals in these positions include writing code to create software programs; creating information systems solutions for an organization's current computer systems; using specialized software to store, organize and protect data; developing applications; creating websites; and, monitoring technical aspects of computer systems, such as performance and capacity.

A recent (January 2015) Education Advisory Board (EAB) Custom Research Brief commissioned by UW-Extension identified significant market demand for computing professionals in the Midwest region (to include Illinois, Iowa, Michigan, Minnesota, and Wisconsin). Key findings from that study identified that:
- The regional labor market analysis revealed strong demand in the Midwest region for professionals with a bachelor's degree in computer science or related field.

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[3] U.S. Department of Labor, Bureau of Labor Statistics, *Occupational Outlook Handbook, Retrieved from* http://www.bls.gov/ooh/computer-and-information-technology/home.htm.

[4] PayScale Human Capital, *2016-2017 College Salary Report*, Retrieved from http://www.payscale.com/college-salary-report/majors-that-pay-you-back.

- Employers in the region posted nearly 80,000 job opportunities for computing professionals from January 2014 to December 2014.
- Enrollment trends indicate strong student demand for online bachelor's-level computer science and related programs. Established programs boast continued enrollments of 150 to 300 students, and attract applicants from across the nation.
- Newer programs (i.e., programs offered for less than three years) maintain smaller enrollments but also display significant enrollment growth from year to year.
- Institutions typically offer online bachelor's programs in computer science and related fields as two-year completion options for students with associate's degrees who have fulfilled general education requirements.
- There is high demand for online degree-completion programs in computer science and related fields from community and technical college students. Students complete a low-cost associate's degree at a 2-year institution before transferring to an online program. These institutions often work with 4-year institutions to develop and implement articulation agreements to ensure students can transfer credits earned at a community or technical college to the online bachelor's degree program.
- Online bachelor's programs in computer science typically offer standardized course sequences that do not include specializations. Administrators at profiled institutions do not offer students the opportunity to pursue specializations within the degree program; course requirements typically leave students with only one or two elective courses within the computer science major. Contacts note that while students may specialize through continued graduate study, most students enter the workforce upon graduation due to strong employment outcomes and high starting salaries.
- Programs often partner with regional employers to provide internship, capstone, or other real-world work experience opportunities for online students. While the distributed geography of online students can make an internship requirement difficult, corporate partnerships provide students with hands-on work experience during their undergraduate study and lead to future offers of employment.[5]

DESCRIPTION OF PROGRAM

General Structure
The online B.S. in Applied Computing degree-completion program represents a fully online fixed curriculum comprising 20 three-credit courses and a one-credit capstone preparation course. The degree program is offered jointly by UW-Milwaukee, UW-Oshkosh, UW-Platteville, UW-River Falls, and UW-Stevens Point.

The B.S. in Applied Computing offers a balance of coursework primarily in the areas of theoretical and applied computing and information systems to prepare a student for multiple pathways into the information technology workforce or support their career advancement if already working in the field. Additional coursework in math, communications, ethics, and project management will serve to further enhance their skills and professional competencies. The capstone course, which serves as the culminating experience in the program, will provide students with the opportunity to participate in a practical, project-based learning experience to demonstrate technical proficiency, analytical thinking and problem solving

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[5] Education Advisory Board (January 2015). Custom Research Brief. *Market Demand for Online Bachelor's Programs in Computer Science: Analysis of Midwest Region Employer Demand.* Commissioned by the University of Wisconsin-Extension.

abilities, project management skills, and communication expertise. Students completing the B.S. in Applied Computing will leave the program as professionals with the following established competencies:
- Demonstrate a solid foundation in core computer science
- Demonstrate a solid foundation in software engineering practices
- Recognize and address security issues
- Implement a computing solution for a business problem
- Demonstrate effective oral and written communication skills
- Demonstrate a solid foundation in data management

It is anticipated that the online B.S. in Applied Computing degree-completion program will predominantly attract adult and nontraditional students who possess a minimum of a completed associate's degree or equivalent credits and have a desire to continue their education toward a bachelor's degree, primarily to expand knowledge and specialized skills in the field and for career advancement. The multidisciplinary curriculum has been designed to prepare computer science professionals to solve real-world problems as part of an interdisciplinary team. A listing of program competencies and outcomes has been provided later in this document.

Students will apply to one of the five partner institutions. Upon a student's admittance, that institution will become the student's administrative home for the degree through graduation. The program will have an academic director at each institution, and each campus will host four to five courses in the curriculum. Students will receive academic advising regarding admission and graduation requirements, and financial aid through their home institution. Faculty and academic advisers at each institution will offer virtual office hours and online chat capabilities, as well as access by telephone and email. Students will have online library access through the home institution.

UW-Extension will partner with the campuses to provide administrative and financial support to the program. A program manager will be housed at UW-Extension and will work in concert with student services staff at the five partner institutions to provide general program information, problem resolution, and career advising online, by phone, or in person (for students near Madison). The program manager will be in close contact with the enrolled students and with the academic program directors to provide the hands-on active support that has been shown to be important for adult and nontraditional learners

Institutional Program Array
There is consensus among the five academic partners that the B.S. in Applied Computing degree program will serve as a valuable complement to the existing undergraduate program array at each of their institutions and will not compete with any program currently offered.

Other Programs in the University of Wisconsin System
A comprehensive search of current undergraduate degrees within the UW System reveals course overlap with a number of the existing computer science, information systems, and related degree programs. However, the majority of these programs are offered in a face-to-face format serving primarily traditional-age students. There are a small number of *online* degree programs within the System which demonstrate minimal overlap in courses and/or competencies to include a Bachelor of Science in Information and Communication Technologies (BSICT) program offered through UW-Stout, and a Bachelor of Science in Information Science and Technology (BSIST) offered through UW-Milwaukee in the Flexible Option format with support from UW-Extension.
The B.S. in Applied Computing degree differs from existing degrees in its blend of deep technical skills and practical application of those skills to real problems in the business world. Compared to Information Systems degrees, students in this degree gain a much deeper understanding of how to develop professional and secure software. When comparing to traditional computer science programs, students get a better understanding of business, professional communication, and project management. Further,

the structure of the program also differs from any existing program in that it is delivered entirely online as a degree completion program targeting adult students. It is expected that the majority of students attracted to this program would not be able to complete a traditional on-campus degree.

An environmental scan of external national online computer science and related programs revealed several similar yet unique offerings from a variety of public, nonprofit and for-profit institutions to include, but not limited to, the following:
- Colorado State University
- DePaul University
- Florida State University
- Penn State World Campus
- Regis University
- Southern New Hampshire University
- University of Illinois-Springfield
- University of Minnesota
- University of Maryland University College
- Strayer University

Collaborative Nature of the Program
The B.S. in Applied Computing is a collaborative degree program that benefits from the shared resources of all partner institutions. UW System encourages and supports system-wide cooperative and collaborative efforts among institutions as one means to develop need-based programs of mutual interest, benefit, and value to all partners; add to the existing base of quality academic offerings within the System; and, more effectively and efficiently address the needs of both traditional and nontraditional learners, as well as employers within the state. This degree, like other collaborative programs currently offered within the System, provides each of the participating academic institutions the ability to offer a high-quality, sustainable program without a requirement to extend significant local resources or a risk of compromising existing programs.

Five partner campuses (UW-Milwaukee, UW-Oshkosh, UW-Platteville, UW-River Falls, and UW-Stevens Point.) collectively contributed in the development of the program curriculum and competencies. All 21 courses have been approved at each of the partner institutions. UW-Extension will provide administrative support, financial investment, marketing, and student services for the program. Although students choose a home institution where they receive the degree, all of the courses are developed and housed at UW-Extension. This cohesive development and offering of courses will ensure students have a consistent experience even though the faculty reside at the different partner institutions. All courses will be listed in the campus registration systems. All partners will share equally in the net revenues from the program, once realized.

In addition, the program will continue to engage external input and advice through a Program Advisory Board consisting of 12 to 15 representatives from industry who will also serve as ambassadors and referral agents to the program. The academic directors from each of the five partner campuses will also hold seats on the Board. The B.S. in Applied Computing Advisory Board will meet biannually. The board members will be asked to help host students working on capstone projects, and to help create school-to-work transitions so that as students graduate from the program, they will move to gainful employment. The program manager will provide assistance to the board, coordinate meetings, and so on. The academic directors of the program and program manager will engage with board members and ensure that the board is connected to the program in constructive and positive ways. Board meetings will provide opportunities to present program progress and successes, and to gather feedback regarding

changes in the industry and how those changes may affect program graduates. The meetings will also help to ensure that the program and curriculum stays relevant to trends in the field.

Finally, it is anticipated that the program will establish several unique partnerships with various companies that represent products and tools commonly used by computer science professionals that may be incorporated into the curriculum/courses. These connections will serve to better prepare and position students for success in the field upon graduation as they put their new knowledge to work.

Diversity
Consistent with current local efforts at all of the partner campuses, this program will strive to achieve inclusive excellence by enrolling, retaining, and graduating sufficient numbers of students from underrepresented populations; engaging faculty from underrepresented populations; implementing strategies to promote and support integration efforts; implementing multidimensional approaches to teaching and learning; and leveraging resources so that the program is able to respond to students' evolving and growing needs.

This degree will target primarily nontraditional student populations. Many students of color, first-generation Americans, first-generation college students, and low-income students are—often by necessity—nontraditional students because they have family or work responsibilities that prevent them from attending school in traditional formats. The online delivery format will also provide opportunities to those students who are time and place bound (do not reside within close proximity to an existing UW institution). Hence, from its inception, this degree is designed to attract underserved students.

While the proposed degree does not project a significant number of new faculty and staff, the partner campuses will continue to be committed to recruiting a culturally diverse campus community. The program will work toward achieving equity in the gender distribution of faculty, and faculty of color will be encouraged to participate in this program.

UW-Extension has several initiatives currently underway to attract more students of color into the UW System. Through UW HELP, brochures focusing on Hispanic and Hmong students are sent to those target groups. The program manager for the B.S. in Applied Computing program employed by UW-Extension will conduct outreach, working with employers to encourage and support the education of their employees, especially focusing on underrepresented minorities. In addition, the Advisory Board will provide support in this area by helping the program extend its reach to diverse prospective students and communities.

Ensuring that diverse student populations enter the B.S. in Applied Computing program is important, but equally important is providing the support services that students need to feel comfortable and able to succeed. The UW-Extension student adviser will work closely with all students to self-identify barriers to their success to either help them overcome those barriers directly or to point them to campus and other resources that will be of assistance to them. UW-Extension will maintain online student environments that will allow individuals from diverse ethnic backgrounds to connect with other students over both cultural similarities and over programmatic interests to help build points of commonality and understanding. Social media opportunities for student connection will be made available through Facebook, Twitter, and LinkedIn, to name a few. Simply put, an essential goal of this program is to increase both the access for diverse audiences to this degree and the success of those students once they enter the program. To ensure that this goal is met, one of the areas of assessment focuses on diversity.

We recognize that adult students come to the learning environment from diverse backgrounds, with their bags packed full of unique knowledge and experiences, and looking for opportunities to share that

knowledge with others. It follows then that the strength of this program and the success of our students is, in large part, based on our ability to attract and retain a diverse adult student audience.

Student Learning Outcomes
During the summer of 2016, the B.S. in Applied Computing curriculum development workgroup, made up of faculty from each of the partner institutions, dedicated significant time to the development of a targeted and powerful program curriculum. This process and ultimate product were significantly enhanced with input from representatives from diverse industry sectors. Specific program competencies and outcomes have been developed by the curriculum planning workgroup and summarized as follows.

Competency A: Demonstrate a solid foundation in core computer science
Student Learning Outcomes:
1. Apply fundamental programming knowledge and techniques to write software of varying complexities
2. Utilize standard data structures and algorithms in the software development process
3. Develop system-level software using operating system theory and concepts
4. Demonstrate the understanding of computer networks, protocols, and devices
5. Describe the professional, ethical, and social issues and responsibilities in the computing field

Competency B: Demonstrate a solid foundation in software engineering practices
Student Learning Outcomes:
1. Analyze a problem and identify and define the computing requirements for a solution
2. Design and create software to solve a defined problem
3. Use testing methodologies to ensure software meets requirements
4. Effectively document software and its development process

Competency C: Recognize and address security issues
Student Learning Outcomes:
1. Describe the elements needed to implement a comprehensive security plan for an organization (e.g. asset security, communication/network security, and identity/access management)
2. Utilize best practices in security engineering when developing software and managing data
3. Describe the privacy, legal, and regulatory compliance environment under which systems operate

Competency D: Implement a computing solution for a business problem
Student Learning Outcomes:
1. Apply Agile and traditional project management methodologies to the development of systems
2. Use systems analysis methodologies to solve a business problem
3. Describe the role and responsibilities of the functional areas of business
4. Describe change management practices and its importance to system implementation
5. Evaluate and make recommendations for adoption of specific computing technologies
6. Explain the role of IT in supporting organizational process and strategy

Competency E: Demonstrate effective oral and written communication skills
Student Learning Outcomes:
1. Write, format, disseminate, and orally communicate technical materials
2. Help non-technical professionals visualize, explore, and act on technical information
3. Facilitate discussions with stakeholders through listening, questioning, and presenting
4. Effectively function in a variety of team environments to accomplish a common goal (e.g. multi-disciplinary, virtual)

Competency F: Demonstrate a solid foundation in data management
Student Learning Outcomes:
1. Design and implement relational and non-relational database systems to support computer-based information systems
2. Demonstrate knowledge of contemporary data management issues

Assessment of Student Learning Outcomes
The assessment of student learning outcomes for the B.S. in Applied Computing degree program will be managed by an assessment team composed of the five academic program directors from each partner campus as well as the UW-Extension program manager. This team also serves as the oversight and decision-making body for the program. The team will meet biannually in person; however, teleconferences may be used to meet more frequently if need arises.

The assessment team will identify and define measures and establish a rubric for evaluating how well students are meeting the program's six competency areas. The team will also identify what data will be needed and serve as the collection point for the data. As a part of the course development process, the assessment team will determine which examples of student work will be most appropriate to demonstrate competency in a specific student learning outcome. Program graduates will be surveyed to determine success in securing employment related to the major, and regarding the types of roles and careers that graduates have entered.

The assessment team will receive data collected from campuses by UW-Extension each semester. UW-Extension will also monitor data on new enrollments, retention rates, and graduation rates. The assessment team will also compile these various sources of data and complete an annual report summarizing the data, the assessment of the data, and decisions regarding improvements to the curriculum, structure, and program delivery. The report will be shared with the faculty of the program and other stakeholders. Decisions of the assessment team will go through the normal curricular processes at each partner institution. The assessment team is responsible for ensuring that recommendations for improvement are implemented.

Student services, instructional, and business office personnel from each institution will also meet annually to review processes and concerns, and to make adjustments as necessary. Program evaluation regarding the collaborative nature of the model will help assess processes critical to the success of the collaboration, such as the financial model, student recruitment and advising, admission and enrollment processes and trends, and curriculum design.

Program assessment and evaluation occur on a more frequent schedule than in traditional academic programs. The B.S. in Applied Computing program will go through an informal program and fiscal review three years following degree implementation. Based on those discussions, recommendations will be made related to the continuation of the program. In addition, the program will engage in a comprehensive five-year review. Designated Program Planning and Review Liaisons at each of the partner campuses will be invited to participate in these review processes.

Program Curriculum
The B.S. in Applied Computing program represents a fixed curriculum comprising 20 three-credit courses (to include a capstone course) and 1 one-credit capstone preparation course (61 credit total). Graduates will leave the program as professionals with a strong foundation in programming, understanding systems and expertise in specialized areas of security and data management. A complete course listing with abbreviated descriptions is summarized as follows:

Course Number	Course Title	Course Description	Host Campus
APC 300	Programming 1	This course offers an introduction to history of computing, fundamental computer concepts and	UW-River Falls

		structured programming techniques. Java will be used to teach the basic concepts of program analysis, design, implementation, debugging and testing. It provides hands-on coverage of simple data types, problem solving, program design, conditional execution, loops, and basic user defined methods.	
APC 310	Math for Computer Science	This course covers important topics that serve as foundation for many computer science courses. These topics may include logic, sets, functions, mathematical reasoning, counting, probability, relations, graphs, trees, Boolean algebra, and algorithms.	UW-Stevens Point
APC 320	Introduction to Business	This course introduces the student to the major functional areas of business including the roles of accounting, finance, human resources, marketing, information systems, and operations in the organization. In addition, the role of business in a free enterprise system, business ethics, leadership, leading change and the competitive global business environment will be covered.	UW-Platteville
APC 330	Technical and Professional Communication	This course covers technical and professional communication skills and techniques. Practice in creating effective memos and reports, developing technical materials, delivering presentations, and developing team communication skills will be the focus of the course.	UW-Platteville
APC 340	Legal and Ethical Responsibilities of the IT Professional	This course explores a range of legal, regulatory, ethical and compliance issues associated with developing software and using information systems in an organization. Topics include the ethical and legal issues associated with data privacy and intellectual property, compliance with regulatory requirements such as Sarbanes Oxley, and other related contemporary subjects.	UW-Oshkosh
APC 350	Programming 2	This course offers continuation of fundamental computer concepts and Programming. It provides hands-on coverage of Methods, File IO, Arrays and their applications, Abstract Data Types, Classes, simple GUI application, and introduction to inheritance and composition.	UW-River Falls
APC 360	Database Management 1	This course covers design and implementation of relational database management systems to support computer-based information systems. Topics include: data modeling techniques such as entity-	UW-Stevens Point

		relationship modeling, extended entity-relationship modeling, database normalization techniques, and basic and advanced features of database query language SQL.	
APC 370	Systems Analysis and Design	This course explores the first five phases of the Systems Development Life Cycle including scope definition, problem analysis, requirements analysis, logical design and decision analysis with the goal of determining an effective system solution. Topics covered include Use Case development, gap analysis, financial analysis of IT investments, and feasibility analysis.	UW-Platteville
APC 380	Project Management Techniques	This course is an introduction to project management tools and techniques including project selection and life cycle, stakeholder management, scope management, budget control, scheduling, quality management, risk identification, and procurement management	UW-Oshkosh
APC 390	Object Oriented Programming	This course offers an introduction to Object-Oriented Programming techniques using the Java programming language. Students will gain skills in using Classes and Interfaces, Exception handling, Programming by Contract, Inheritance, Polymorphism, Overloading, Abstract Classes and Methods, Serialization, Generics, and an Introduction to Recursion.	UW-River Falls
APC 400	Applied Communication Networks	This course covers fundamental concepts in the design, configuration, and problem solving of computer networks. Topics include: TCP/IP and OSI architecture, application layer (Web, FTP, remote connection, email, client and server interaction), transport layer (TCP/UDP), network layer (IP), data link and physical layers.	UW-Platteville
APC 410	Database Management 2	This course covers architecture and use-cases of non-relational (NoSQL) based on four types of databases including document, Graph, Key-value, and wide column store. Topics include: data types, create/update/delete data, query, cursors, indexing, dynamic schema design, scalability (scale-out) over scale-up of RDBMS, analysis of massive unstructured and semi-structured data and data security.	UW-Stevens Point
APC 420	Computer Security 1	This course covers topics spanning security and risk management, security engineering, identity and access management, and security operations. Topics	UW-Milwaukee

		include cryptography, access control models, malicious software and counter-measures, security policy, security model, trust, vulnerability assessment, security standards and evaluation, administration and auditing, and secure storage.	
APC 430	Applied Data Structures and Algorithms	This course covers fundamental concepts and the application of data structures and algorithms. Topics may include abstract data type, dynamic array, iterators, linked list, generics, stacks, queues, binary search tree, navigating trees, collections, maps, heaps, hashing, graphs, and sorting	UW-Milwaukee
APC 440	Web Development	This course teaches students how to create advanced and interactive websites using technologies like HTML 5, CSS, JavaScript, Bootstrap, XML, web services, and database integration within the ASP.Net/Java/XX platform. The class also introduces principles of good user interaction design to the creation of effective web pages.	UW-Oshkosh
APC 450	Operating Systems Theory and Practice	This course provides introduction to important operating systems concepts such as processes, threads, scheduling, concurrency control and memory management. The students will learn these concepts via systems programming using POSIX API.	UW-Milwaukee
APC 460	Software Engineering Practices	This course covers basic software development methodologies and tools. Methodologies include the waterfall, iterative and agile approaches. Tools include integrated development environments (IDEs), unified modeling language (UML), and testing frameworks. Other topics include requirements analysis, object-oriented analysis, test-driven development, and design patterns. Students will work on a team software project.	UW-River Falls
APC 470	IS Strategy and Management	This course begins with an exploration of organizational strategy and how Information Systems strategy is developed to support the attainment of organizational goals. The course then explores the management of the IS function using a capability maturity model approach to topics such as budgeting, acquisition, service management, change management, and personnel management.	UW-Oshkosh
APC 480	Computer Security 2	This course covers topics spanning communication and network security, security assessment and testing, software development security, and asset security. Specific topics include operating system	UW-Milwaukee

		security, network security (e.g. firewalls, tunneling, intrusion detection, and wireless networking), browser security, and application security (e.g. database security, email security, payment system security, and digital-rights management).	
APC 490	Capstone Project Preparation	Capstone Prep (1 credit) The purpose of this course is for students to choose a capstone project, create an initial plan with specific deliverables identified, and receive approval. This course covers review of key concepts necessary for success in the Capstone (ACS 495) course, including software engineering practices, project management techniques, systems analysis, and communicating with technical or non-technical audiences (CTO, IT staff, etc.). May include additional topics specific to anticipated capstone projects.	UW-Stevens Point
APC 495	Capstone Project	Capstone The purpose of this course is for students to complete the project that was approved in ACS 490. This course covers development, management and delivery of an applied computer science project for a client, including communication of project requirements and status to a non-technical audience.	UW-Stevens Point

The curriculum planning workgroup has identified the following program prerequisite(s):
- College Algebra

Admission requirements will include a 2.0 GPA and 60 transferable credits.

Projected Time to Degree
Based on experience with similar collaborative offerings within the System and the typical adult student profile, it is assumed that most students will enroll part-time and take an average of five to six courses per year. At this rate, the majority of students would complete the program within 3 to 4 years. Students may enter the program for the spring, summer, or fall semester. Students will be encouraged to take courses in sequence and as influenced by internal course prerequisites. The capstone, which represents the culminating experience for students, must be taken in the final semester of study.

Program Review Process
The collaborative partners, including all five academic institutions and UW-Extension, will review the program annually. Academic directors, faculty, and administrators from all partners will have input into programmatic changes and upcoming needs. UW-Extension, as the fiscal agent for this program, will manage resources to ensure that funds are available to invest in the program as needed. The decision about how to invest in the program will be made collaboratively by all partners. As defined in the partner agreement, the program will engage in an internal 3-year review focusing on program, administrative and fiscal matters. In addition, the program will conduct a formal 5-year review as required by UW System.

<u>Institutional Review</u>
Each of the partner institutions provides a comprehensive review of academic programs as noted below.

    <u>UW-Milwaukee</u>…The audit and review of undergraduate programs at the University of Wisconsin -- Milwaukee is conducted by the UWM Academic Program and Curriculum Committee (APCC) 5 years after launch and every 10 years after that. Program chairs will be notified by the APCC of the imminent review no later than January preceding the academic year of the review. Program chairs shall oversee the information-gathering and program assessment in order to meet the October 1 deadline for the Self-Evaluation report.

    <u>UW-Oshkosh</u>…Academic program review will occur every seven years except for new programs which must undergo a joint System and institution review after five years. Program faculty and Deans should seek evaluation by external consultants as a supplement to the internal self-study. The following high level items are included in the program review: description of the program, staffing, resources needed such as library collections or computing services, an evaluation of the program and recommendations for the program going forward.

    <u>UW-Platteville</u>…Academic program reviews occur every six years. The review is conducted over a two year period. The Academic Planning Council is responsible for conducting program assessments. The process includes reports from the Assessment Oversight Committee, the Academic Standards Committee and the University Academic Budget Committee.

    <u>UW-River Falls</u>…All academic programs (i.e., entitled majors and graduate programs and associated sub-majors) must complete an approved program audit and review process each six years. New programs must complete a special review in the fifth year subsequent to their entitlement. Following this, subsequent reviews take place every six years. The Provost and Vice Chancellor for Academic Affairs, the Faculty Senate Assessment Committee, and the Associate Vice Chancellor for Academic Affairs are jointly responsible for assessment initiatives. These units work together to support assessment efforts, and to ensure that assessment is being used for program improvement.

    <u>UW Stevens Point</u>…The Department Review Subcommittee, which resides under the Faculty Senate's Academic Affairs Committee, reviews academic programs according to the Reporting Cycle for Assessment and Program Review. This occurs at 5 year intervals.

<u>Accreditation</u>
Partners will be securing authorization to offer this collaborative, online degree from the Higher Learning Commission, the regional accrediting body for all five partner institutions. Each of the participating academic partners is currently under the Higher Learning Commission defined threshold for online program offerings.

Ph.D. Qualifying Examination Guidelines

Original Text

Qualifying Examination

A qualifying examination must be taken to determine whether the individual is qualified for doctoral-level work. For students entering with a bachelor's degree, this examination, which will be written, may be taken after 18 credits of graduate work have been earned and must be satisfactorily completed before 30 credits of graduate work have been completed. Students admitted after completing an appropriate master's degree must take this examination in the semester immediately after 18 credits of graduate course work have been earned at UWM.

The examination will be for a given area, but will also include material on basic engineering principles. The examination will normally be offered twice a year during the regular academic year. A student may take the examination twice; if a passing grade is not obtained on the second attempt the applicant will not be permitted to proceed toward the Doctor of Philosophy degree.

Proposed Revision

Qualifying Examination

Each student in the program must take and pass a Qualifying Examination to demonstrate that the student is qualified for doctoral-level work. The Qualifying Examination is a written exam and is structured in two parts: Part 1 and Part 2. The examination is offered twice a year during the regular academic year. The content of the examination varies among the major areas of the Ph.D. in Engineering program.

Students entering with only a bachelor's degree or with a master's degree in an area unrelated to their major area may take the Qualifying Examination for the first time after earning 12 credits of graduate work at UWM and must successfully pass the exam before earning 30 credits of graduate work at UWM. Students admitted after completing an appropriate master's degree must take this examination no later than the semester immediately after 18 credits of graduate work have been earned at UWM.

A student may take the Qualifying Examination twice. On the first attempt, the student must attempt both Part 1 and Part 2 of the examination.
- If the student passes both parts, then the student has passed the entire examination and will be permitted to proceed toward the Doctor of Philosophy degree.
- If the student fails both parts, then the student must take the entire exam again at its next offering.
- If a student passes only one of the two parts, then the student must take the examination again at its next offering, but may choose to take only the part of the examination that was not passed on the first attempt.

If a passing grade is not obtained on the second attempt of the Qualifying Examination, the student will not be permitted to proceed toward the Doctor of Philosophy degree.