**NEW**

PROGRAM PROPOSAL

WEBER STATE UNIVERSITY

**Submission Date:** Jan 5, 2015

**College:** College of Applied Science and Technology

**Department**: Computer Science

**Program Title:** Programming Essentials Institutional Certificate

**1. Complete Program Description**

The Department of Computer Science (CS) offers an Associate of Applied Science (AAS) Degree and a Bachelor of Science (BS) Degree in Computer Science, as well as an Institutional Certificate in Game Development and a departmental certificate in Mobile Application Development. The CS curriculum offers flexibility in that students may tailor their program of study to their interests and professional aspirations. The CS department is ABET accredited and the CS curriculum is aligned with ABET suggested program outcomes and also provides a Customized Option for students seeking a second bachelor’s degree or a minor in a different academic area. The Department also offers a minor, a teaching minor, and a BIS concentration.

The Computer Science program employs a technical, scientific approach requiring a solid foundation in mathematics and physics. The program blends scientific and engineering principles implemented through actual, practical, and applications-oriented experience as well as the intellectual study of computation. It is designed to provide a sound fundamental understanding of logic and of digital computer organization as well as the interaction between hardware, software, and the interconnection of system components. Also emphasized is software engineering which includes understanding operating systems design, implementing the theory of computing, analysis of algorithms, simulation design, and the development of knowledge-based systems. The objectives of the Computer Science program are to provide students with an education that will help them achieve their academic and career goals while simultaneously meeting the needs of industry partners.

The Institutional Certificate in Programming Essentials will provide a measured, proven, and effective introduction to programming concepts and best practices in software development. The certificate will leverage four core courses currently listed in the CS curriculum that constitute the CS program’s primary incremental track in instruction on computer programming. Recent trends in workplace technology reveal that a significant population of the workforce, regardless of their initial area of expertise, would benefit from some basic knowledge of coding. This certificate would be available to community members seeking to acquire essential programming skills as well as students simultaneously seeking an AAS or BS degree in Computer Science. This Institutional Certificate will emphasize hands-on programming techniques, development of software applications, and exposure to the most widely used programming languages. A student receiving this certificate will possess a level of coding competency that will prepare them to successfully develop useful, reliable software, and to contribute meaningfully to projects that possess a programming component.

**2. Purpose of Degree**

Jeannette M. Wing, current corporate Vice President of Microsoft Research and former President’s Professor of Computer Science at Carnegie Mellon University, states that “Computational thinking represents a universally applicable attitude and skill set everyone, not just computer scientists, would be eager to learn and use.” With increasing frequency, individuals with non-computing backgrounds are confronted with software challenges in the workplace that could be easily rectified with a modest understanding of computer programming. The ability to manage and control software through coding represents a vital, fundamental skill set that should be available to everyone, not just those individuals in pursuit of a formal Computer Science degree.

The proposed Institutional Certificate addresses this growing need by providing training that would raise both the competency and comfort level of those individuals seeking to attain a demonstrated proficiency in computer programming. Many technical and non-technical professionals with no programming experience who have been in the workforce for some time regard coding as a vital skill set to be acquired through continuing education. The Institutional Certificate proposed here would provide an accessible and flexible avenue for both working professionals and current students to gain expertise in this area of high demand. Also, in conjunction with WSU Continuing Education (CE), the Department of Computer Science seeks to develop innovative delivery methods of this certificate, such as fast-track options both online and at the new CE facility in Farmington, UT. This proposed Institutional Certificate would serve various populations in the surrounding community eager to gain the professional and economic benefits associated with a working, constructive knowledge of computer programming.

**3. Institutional Readiness**

The program will consist of four courses that are currently listed within the Computer Science program. These courses have been delivered numerous times previously to students in the CS program and thus have been assessed for their effectiveness and content. No new organizational or administrative structures are required. Because the courses are currently required and fully integrated into the CS program, no impact to the delivery of undergraduate or lower-division education is anticipated.

**4. Faculty**

No additional new faculty will be required to offer the proposed Institutional Certificate. Existing expertise levels of the CS faculty will supply the instructional support for the four courses that are required for the certificate.

**5. Staff**

No additional staff will be required to offer the proposed Institutional Certificate.

**6. Library and Information Resources**

Because the existing ongoing courses required for this Institutional Certificate were granted library approval when they were first proposed as new courses, no additional library resources will be needed.

**7. Admission Requirements**

A student may pursue a Programming Essentials Institutional Certificate by applying for admission to Weber State University.

**8. Student Advisement**

Prospective students interested in the Programming Essentials Institutional Certificate may avail themselves of the advising faculty traditionally provided by the Department of Computer Science. Current CS students pursuing an AAS and BS can integrate the classes needed to earn this certificate into their program of study. Post-graduate students will be referred to advising faculty to establish a timetable in which the required courses for the Certificate can be completed.

**9. Justification for Graduation Standards and Number of Credits**

Section 3 of the University Curriculum Committee Policy and Procedures Manual states:“Students are awarded an Institutional Certificate when they complete a program of study fulfilling a **10 credit hour minimum in residence at Weber State**. Course work for institutional certificates is designed in a specific area for career and technical education purposes or for professional development.” From past certificate program applications made by this department, it was discovered that an Institutional Certificate in fact requires at least **16** credit hours minimum.

Since this proposal seeks an **Institutional Certificate** and *not* a departmental certificate, the program described herein will require a total of 16 credit hours. The requirements for the Certificate were carefully examined by all members of the CS Faculty to ensure a comprehensive treatment of computer programming strategies while avoiding extraneous topics irrelevant to the purpose of the Certificate. The CS Faculty believes the requirements of the program are more than sufficient to satisfy the needs of both the student and industry.

**10. External Review and Accreditation**

Industry advisors to the CS department were polled about the overall value and importance of a Programming Essentials Institutional Certificate – all agreed that this type of certificate would be beneficial for the department, university, and community. No paid external consultants were involved in the details of developing the proposed program. As indicated above, all CS Faculty were consulted about the specific requirements for the certificate.

**11. Projected Enrollment**

Based on current student enrollments in the four courses that comprise this proposed Institutional Certificate, interest expressed by local industry partners, and the projected overall draw from community members, the following table provides projected enrollment numbers:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Year | Student Headcount | # of Faculty | Student-to-Faculty Ratio | Accreditation Req’d Ratio |
| 1 | 20 | 3 | 6.66 | N/A |
| 2 | 50 | 3 | 16.66 | N/A |
| 3 | 90 | 4 | 22.5 | N/A |
| 4 | 140 | 5 | 28 | N/A |
| 5 | 200 | 5 | 40 | N/A |

**12. Expansion of Existing Program**

This proposed Institutional Certificate is regarded as a self-contained, stand-alone offering separate from the current AAS/BS programs in Computer Science.

**Need**

**13. Program Need**

Computing devices are ubiquitous both in the workplace and at home, entering almost every arena of human society. The U.S. Department of Labor Bureau of Labor Statistics indicates that computer-related occupations experienced a 38% increase in employment from 2003 to 2013, adding one million more jobs during that time period. The overall segment of jobs that require some kind of computer skills or literacy has been estimated as high as 50%, with some experts claiming that percentage will increase to 77% in the next decade (US Bureau of Labor Statistics). Proficiency in basic computer programming strategies goes well beyond the current generally accepted definition of ‘computer literacy,’ but will most likely be incorporated into this definition in the near future.

Given the dramatic proliferation of computing platforms, there exists a corresponding increasing need for individuals who can manage and control these devices through scripting and coding. This technological wave should not be ignored by either industry or academia. The Institutional Certificate proposed here can be regarded as part of Weber State University’s response to supplying the workforce and knowledge-base necessary to support and sustain this evolutionary technological change. In addition, the availability of this certificate will play a role in achieving the Utah higher education goals put forth by the Governor’s office: namely, to have 66% of Utahns – men and women age 25 to 64 – with a postsecondary degree or certificate by the year 2020.

**14. Labor Market Demand**

Various online job boards and market analysis sites have consistently reported extremely high demand for individuals with some level of competency in computer programming. The non-profit site *code.org* indicates that in Utah alone, there are 5040 open computing jobs (growing at 2.6 times the state average) compared to just 1825 computer science graduates.

Computer programming drives both job growth and innovation throughout our economy and society. More than half of projected jobs in STEM (Science, Technology, Engineering, and Mathematics) fields are in computing occupations. These positions dominate “help wanted” ads and basic programming knowledge is already a fundamental skill required to accomplish occupational tasks for many workers in the technology-driven world of the 21st century.

The U.S. Department of Labor Bureau of Labor Statistics reports that employment of computer programmers is projected to grow 8% from 2012 to 2022. Computer programmers are employed in various industries and can typically perform their work from anywhere, which allows for more flexible schedules and work arrangements. Given the overall positive outlook for computer programmers, the proposed Institutional Certificate will help increase the value of current professionals in the workplace and provide an initial pathway toward retraining those individuals in a potentially lucrative career.

**15. Student Demand**

Interest in Computer Science continues to grow, as reflected in department enrollments, indicating a recognition by students of all ages and backgrounds that understanding both the technical and social aspects of computing is a vital endeavor. The four courses that constitute the proposed Institutional Certificate have been offered to Weber State University students each semester (including Summer) for more than 15 years. Enrollments in each of these sections have increased steadily over the past five years as the awareness of the importance of computing has correspondingly grown. We project that student demand, both from the degree-seeking and continuing education populations, will continue to increase as programming becomes regarded as an essential skill set for all individuals.

**16. Similar Programs**

Various programs in Utah necessarily include computer programming as part of their overall credential, since this area is absolutely integral to earning AAS and BS degrees in the computing sciences. Available certificate programs are typically broadly defined, with programming representing one core aspect of the curriculum. These certificate programs include the Davis Applied Technology College (DATC) and Ogden-Weber Applied Technology College (OWATC) Certificates in Information Technology, Utah Valley University’s 30-credit Certificate of Completion in Programming, and the University of Utah Continuing Education IT Skills Certificate. Besides overall scope, one important distinguishing characteristic between the programs listed above and the proposed Institutional Certificate is the potential time-to-completion. On average, the Certificates above require from between 1 to 2 years to complete, whereas the implementation of “fast-track” delivery methods in conjunction with Continuing Education could result in student certificate awards in as little as 6 months.

The unique programming-specific offering proposed by this Institutional Certificate will be maintained and administered by the Weber State Computer Science department and will serve individuals and industry in the Northern Utah region. This WSU Institutional Certificate program will essentially provide an avenue for students and working professionals in Weber, Davis, and Morgan counties to formally substantiate and validate computer programming expertise through a certificate process administered through a recognized Utah institution of higher education.

**17. Collaboration with and Impact on Other USHE Institutions**

As noted above, the proposed Institutional Certificate program provides instruction exclusively targeting the enhancement of computer programming skills, and does not address other important aspects of computing such as databases or software engineering. As such, this qualifies as a unique certificate offering, distinct from any other program currently made available by other institutions in the region. Because the purpose of this certificate is to provide students and working professionals primarily from the local Northern Utah community with a basic core competency in computer programming, very little to no impact is projected for existing programs.

**18. Benefits**

The availability of a certificate in Programming Essentials would raise Weber State University’s profile as an institution that responds to current technological trends in both the workplace and the community. Offering this certificate track at the new Farmington center or Weber State Downtown would significantly bolster Weber State’s efforts to solidify and expand its working relationship with Davis County and Ogden City. In addition, the introduction of this certificate will play a role in achieving the Utah higher education goals put forth by the Governor’s office: namely, to have 66% of Utahns – men and women age 25 to 64 – with a postsecondary degree or certificate by the year 2020.

**19. Consistency with Institutional Mission**

This proposed certificate program aligns with the Institutional Mission, Vision, Core Themes, and Core Values of Weber State University. Providing Access (Core Theme) to training in an exponentially growing technical discipline, the Programming Essentials certificate will expand the careers of northern Utah’s computing professionals and promote the entrepreneurial efforts of professionals who grasp the opportunities in this cutting-edge field, thereby strengthening the University’s position as an “economic leader for the region.” (Mission). Because the certificate will satisfy an educational/training need in the local business community, the program will also increase WSU’s community engagement (Vision, Core Themes, Core Values) and also raise community awareness of WSU’s support of the technology sector.

**Program and Student Assessment**

**20. Program Assessment**

**Program goal:** A student receiving this certificate will be prepared to address and resolve fundamental computing challenges requiring a basic working knowledge of computer programming in both industrial and research settings.

The courses that constitute the certificate will be reviewed on a semester basis by CS faculty to ensure that topics are current and applicable to the workplace, and allow certified students to pursue ongoing investigation and research into software development. Reviews of the individual courses will also include industry experts, identified through the Weber State University Research Foundation and the WSU Computer Science Industry Advisory Council. As students earn this certificate, inquiries will be made of the organizations that employ these students to “close the loop” about the effectiveness of the program. Feedback from industry partners will be used to adjust course delivery and projects as needed.

**21. Expected Standards of Performance**

Students will demonstrate technical proficiency in designing and developing operational computer programs for the most widely used and available platforms. The technologies selected for this certificate include those that currently enjoy the most popular and widespread support among technologists and computer science professionals.

Each course within the certificate will require traditional classroom formative and summative assessments such as exams and course projects (see attached syllabi). The grading standards currently enforced by the Computer Science department will also apply to students who seek to earn the proposed certificate.

**Program Curriculum**

**22. All Program Courses**

*List all courses, including new courses, to be offered in the proposed program by prefix, number, title, and credit hours.*

|  |  |  |
| --- | --- | --- |
| **Course Prefix & Number** | **Title** | **Credit Hours** |
| **CS 1030** | **Foundations of Computer Science** | **4** |
| **CS 1400** | **Fundamentals of Programming** | **4** |
| **CS 1410** | **Object-Oriented Programming** | **4** |
| **CS 2420** | **Introduction to Data Structures and Algorithms** | **4** |
|  | **Total Number of Credits** | **16** |

**23. New Courses to be Added in the Next Five Years**

No new courses are currently planned. However, demand for new/replacement courses based on emerging computing technologies and platforms will most definitely be considered.

**INFORMATION PAGE**

Did this program proposal receive unanimous approval within the Department? \_**Yes**\_ If not, what are the major concerns raised by the opponents?

Explain how this program will differ from similar offerings by other departments. Also explain any effects this proposal will have on program requirements or enrollments in other departments including the Bachelor of Integrated Studies Program. In the case of similar offerings or affected programs, **you should include letters from the departments in question stating their support or opposition to the proposed program**.

No effect on other programs.

**A Master’s Degree program** must have a **minimum of 30 credit hours with a maximum of 36 credit hours**.

**A Bachelor** of Arts, Bachelor of Science, Bachelor of Fine Arts, Bachelor of Music, or Bachelor of Integrated Studies must have a **minimum of 120 credit hours with a program maximum of 126 hours** (This is a state system-wide requirement). Exceptions for the maximum number of program hours are allowed if accreditation issues require a set number of courses within a given program, i.e. Dental Hygiene, Nursing, Radiology**.**

**An Associate of Arts or an Associate of Science must have a minimum of 60 credit hours with a program maximum of 63 credit hours**. **An Associate of Applied Science must have a minimum of 63 credit hours with a program maximum of 69 credit hours.**

**Major programs that require a minor will consist of not fewer than 30 credits and not more than 48** credits in the major field. **Major programs that do not require a minor** shall consist of **not more than 63 credits in the major field.**

**A minor is a program** of study generally selected to complement and strengthen a student’s major and/or enrich the student’s overall educational program. **A minor consists of not fewer than 15 credits**. Courses that are used to satisfy the general education requirements can be used as part of the minimum number of hours needed for the minor requirements, unless prohibited by a particular college or department.

**Indicate the number of credit hours** for course work within the proposed program. (Do not include credit hours for General Education, SI, Diversity, or other courses unless those courses fulfill requirements within the proposed program.) \_\_16\_\_\_\_\_\_\_\_

**Submit the original** to the Faculty Senate Office**, MC 1033,** and an **electronic copy to** bstockberger@weber.edu

Proposed Program Catalog Listing:

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| **Programming Essentials Institutional Certificate** |
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A student may apply for a certificate of competency in Programming Essentials provided he or she has fulfilled the following requirements:* 1. Application for admission to Weber State University and/or current degree-seeking status.
1. Completion of the following required courses with a grade of C or better. These courses may also be slotted appropriately for degree requirements.
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| **(16 credit hours):*** CS 1030 – Foundations of Computer Science **(4)**
* CS 1400 – Fundamentals of Programming **(4)**
* CS 1410 – Object-Oriented Programming **(4)**
* CS 2420 – Introduction to Data Structures and Algorithms **(4)**
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