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July 6, 2016

MEMORANDUM

TO: State Board of Regents

FROM: David L. Buhler

SUBJECT: Utah Valley University – Master of Computer Science

Issue

Utah Valley University (UVU) requests approval to offer a Master of Computer Science effective Fall Semester, 2017. This proposal was approved by the institutional Board of Trustees March 30, 2016.

Background

Utah Valley University resides in a service area that is experiencing strong economic growth. Local industry requires an increasing number of employees who are educationally prepared to meet modern workforce challenges. The proposed Master of Computer Science (MCS) at UVU is designed to provide an expanded continuum of educational opportunity in UVU's service region to support the high technology environment that is central to the Utah County economy.

The MCS is an applied graduate program resulting in a professional degree. The Computer Science (CS) Department is proposing an MCS rather than a Master of Science degree in order to focus on preparing students to enter the workforce as leaders and innovators. Utah Valley University has chosen this position, in part, to respond to the needs of its local computer-based industry that needs computer professionals at all levels, including those prepared with a master's degree.

Students graduating with this degree will be grounded in computer science as a discipline and will be equipped to assume leadership roles in a range of computing technology occupations. Curriculum is focused on developing software systems while allowing students the freedom to explore and expand upon new technologies to solve real-world problems.

The MCS program culminates in a two-semester graduate project, where students design and implement a large software system over the course of a full academic year. Students will be expected to not only show technical ability in the system's design and implementation, but to demonstrate the ability to manage the project effectively through its lifecycle. It is intended that some of the projects will involve cooperative learning with local community companies and governmental entities.

A report from the Utah Department of Workforce Services that combined Computer and Mathematical jobs into a single category projected 1,790 annual job openings. This results in a 3.2% projected growth rate for

Utah as a whole and a 4% growth rate for the Provo-Orem metropolitan area. By 2022 projections are that Utah companies will need to fill a cumulative 48,170 jobs in this category. Of this total only 2,500 jobs come from the mathematical field. All others can be considered computer science or computer science-related jobs. The Provo-Orem area is predicted to need 11,050 of these total jobs. A labor market report prepared by UVU indicated that 18.2% of the computer science-related jobs in Utah require graduate or professional degrees.

The Department of Workforce Services projects annual median compensation in the Provo-Orem metropolitan area for the following computer science-related occupations: $68,670 for Computer Systems Analysts (SOC code 15-1121), $76,380 for Computer Programmers (SOC code 15-1131), and $92,170 for Computer Network Architects (SOC code 15-1143).

Utah Valley University anticipates hiring two additional full-time faculty members to support the program. Program costs will be covered through new appropriations that have been provided to UVU as well as from differential tuition assessed for graduate-level courses.

Policy Issues

The proposed program has been developed through established institutional procedures and Board of Regents policy. Chief academic officers as well as faculty in related departments from the Utah System of Higher Education institutions have reviewed the proposal and have provided input. There are no additional policy issues that need to be addressed relative to approval of the program.

Commissioner's Recommendation

The Commissioner recommends the Board of Regents approve the request from Utah Valley University to offer a Master of Computer Science.

_____
David L. Buhler
Commissioner of Higher Education

DLB/BKC
Attachment

Program Description – Full Template
Utah Valley University
Master of Computer Science

Section I: The Request

The Computer Science Department in the College of Technology and Computing at Utah Valley University requests to offer a Master of Computer Science effective Fall Semester, 2017. The UVU Board of Trustees approved this program March 30, 2016.

Section II: Program Description

Complete Program Description

The proposed Master of Computer Science (MCS) at Utah Valley University (UVU) is an applied graduate program resulting in a professional degree. The Computer Science (CS) Department is proposing an MCS rather than a Master of Science (MS) in Computer Science as the focus is on preparing students to enter the local, national, and global workforce as leaders and innovators rather than focusing on preparing students to conduct basic research. Utah Valley University has chosen this position because: 1) UVU focuses on applied and practical learning, 2) the CS faculty is confident and experienced in this mission, 3) the Provo-Orem Metropolitan Area needs more skilled computer science professionals entering the workforce at the master's level, and 4) there are other universities within the state better positioned to prepare students to conduct research in computer science.

Students graduating with this degree will have a broad grounding in computer science as a discipline and be well equipped to take on leadership roles in a wide range of computing technology-related industries. Student education will be focused on developing software systems using current technologies while allowing them the freedom to explore and exploit new technologies to solve real-world problems. A predictive model created by the CS Department estimates an initial enrollment in the MCS of 20 students each year for the first few years. The model is based upon survey data of UVU students and expected community interest in the Provo-Orem Metropolitan Area. The MCS program is intended to serve the needs of the local community, without excluding national or global trends, by teaching advanced, practical software design and development skills that are needed by modern high-tech firms. It will be positioned to attract both students graduating with a baccalaureate degree and professionals who wish to enhance their software skills. The MCS curriculum has been designed around three key elements. These key elements will be used to support student outcomes for the MCS and the student outcomes used to support the University's essential learned outcomes. The key elements are:

1. The MCS degree will provide students with a rigorous computer science education.
2. The MCS degree will be relevant to students and local community.
3. The MCS degree will be practical so that students can apply the theory they learn.

The MCS program culminates in a two-semester graduate project, where students design and implement a large software system over the course of a full academic year. They are expected to not only show technical ability in the system's design and implementation, but to demonstrate the ability to manage the project effectively through its lifecycle. It is intended that some of the projects will be cooperative learning projects with local community companies and governmental entities.

Purpose of Degree

Computer science is a diverse and complex field. While all students who learn computer science learn to program, it is naïve to assume that anyone who can program is a computer scientist or that all computer scientists are the same. Graduates work on problems as varied as fighter jets to e-commerce, and computer games to medical software. For example, CS Alumni, Stephen Shaw (Xamarin), Rafael Lima (Amazon), and Ethan Welborn (Riot Games), each rely upon a very different skill set to be successful because their respective

companies develop very different products. The MCS is flexible to support this need for different skill sets among students. The institution's undergraduate program does an excellent job of preparing students to enter the workforce and to be highly productive with the skills and confidence to learn new technologies that can be applied to address current problems experienced by industry.

A focal point of this degree is the need for students to encounter large complex problems that require months of effort rather than just the weeks afforded in a semester. The difficulty of a software development project grows exponentially as the project grows larger, thus a single 1,500-line program is significantly more difficult to complete than five projects, each of 300 lines. Undergraduate students only achieve the level of professional maturity they need in terms of depth and breadth of knowledge to tackle these problems as they reach their senior year. The MCS will provide the additional time needed, by both students and faculty, to not only prepare students to enter the workforce as highly productive members but to become leaders and innovators of it. The MCS will address the most important elements of developing large, complex systems.

Institutional Readiness

The existing structure in the College of Technology and Computing is prepared to initiate the program. While the CS Department has terminally qualified faculty to provide a quality graduate program, the department will need to hire two new full-time faculty members to meet the increased load associated with the program.

The Computer Science and Engineering building has several classrooms and laboratories. At this time, it is believed that these classrooms will be enough to accommodate the relatively few courses and students added. With the anticipation of additional faculty, some adjustments are necessary for appropriate office space.

The Computer Science Department anticipates that current faculty members will teach many of the graduate courses and serve as project committee chairs and committee members, but still teach in the undergraduate program. However, faculty who are teaching graduate courses and working with graduate students will not teach as many sections of undergraduate courses. The impact of fewer faculty members available for undergraduate instruction is minimal at the present time if additional faculty members are hired.

The CS Department anticipates needing up to four additional classrooms during prime-time hours. With the new classroom building, the university should have enough space to cover between three to five additional daytime sections.

Departmental Faculty

Faculty Category	Faculty Headcount – Prior to Program Implementation	Faculty Additions to Support Program	Faculty Headcount at Full Program Implementation
With Doctoral Degrees (Including MFA and other terminal degrees, as specified by the institution)			
Full-time Tenured	9		9
Full-time Non-Tenured	4	2	6
Part-time Tenured			
Part-time Non-Tenured			
With Master's Degrees			
Full-time Tenured	4		4
Full-time Non-Tenured			
Part-time Tenured			

Part-time Non-Tenured	1		1
With Bachelor's Degrees			
Full-time Tenured			
Full-time Non-Tenured			
Part-time Tenured			
Part-time Non-Tenured	4		4
Other			
Full-time Tenured			
Full-time Non-Tenured			
Part-time Tenured			
Part-time Non-Tenured			
Total Headcount Faculty			
Full-time Tenured	13		13
Full-time Non-Tenured	4	2	6
Part-time Tenured			
Part-time Non-Tenured	5		5
Total Department Faculty FTE (As reported in the most recent A-1/S-11 Institutional Cost Study for "prior to program implementation" and using the A-1/S-11 Cost Study Definition for the projected "at full program implementation.")	22	2.00	24.00

Staff

The CS Department will need an additional advisor to handle the load of approximately 60 students once the program is fully implemented in three years.

Library and Information Resources

The library at Utah Valley University is positioned to be able to support the proposed Master in Computer Science. Because of the rapidly changing nature of computer science, journals and conference proceedings are central to literature needed by students in this field. The UVU library subscribes to the Association for Computing Machinery (ACM) electronic library that includes the publications and proceedings of that major professional society. The UVU library also subscribes to the Institute of Electrical and Electronics Engineers (IEEE) Online core collection of journals and conference proceedings.

The UVU library currently houses a collection of over 254,000 titles supporting the college's major fields of study. The library is a member of the Utah Academic Library Consortium (UALC). Through partnership with other libraries, UVU is able to provide over 70,000 full-text periodicals accessible from the library homepage (http://www.uvu.edu/library).

Admission Requirements

The MCS will use five factors in determining a student's readiness to enter the program:

1. Applicant's application for admission to the MCS will include letters of recommendation and a statement of purpose.
2. Applicant's official academic transcripts.
    a. Applicants will be expected to have an overall grade point average in their undergraduate work of 3.0 or higher on a 4.0 scale.
3. For international students whose native language is not English, a TOEFL score of 80 iBT (550 pBT) or higher, or an IELTS band score of 6.5 or higher within the past two years, is required.
4. Applicant's fundamental computer science background:
    a. Applicants with a bachelor's degree in a computer-related field (Computer Science, Computer Engineering, Software Engineering, or a closely related field) who have completed the following courses (or equivalent courses from other institutions) with a C+ or better will be deemed to have the fundamental computer science background to enter the program:
        i. CS 2300 Discrete Structures I
        ii. CS 2420 Introduction to Algorithms and Data Structures
        iii. CS 2810 Computer Organization and Architecture
        iv. CS 3060 Operating Systems Theory
        v. MATH 1210 Calculus I
    b. Applicants without a bachelor's degree in a computer-related field or who have not completed the above courses with a C+ will be deemed lacking in fundamental computer science background to enter the program.
    c. Applicants found lacking in fundamental computer science background can be conditionally admitted to the MCS. Conditionally admitted students will have an individualized MCS Leveling Plan (MCS LP) developed for them by the Computer Science Graduate Committee. Once the MCS LP has been met by the applicant, the applicant will be deemed to have the fundamental computer science background to enter the program. Graduate policy precludes conditionally admitted students from taking 6000 level courses.
5. All applicants will be subject to the approval of the Computer Science Graduate Committee.

Student Advisement

Advisement will consist of two parts: staff advisors and faculty advisors. Staff advisors will help graduate students with course selection. Additional advisement will be provided by a faculty advisor and a project committee. Faculty advisors will support students with their project proposal. The project committee will insure the quality of the design and implementation of the project.

Justification for Graduation Standards and Number of Credits

The graduation standards listed below would demonstrate a student's appropriate acquisition of the intended program outcomes and standards. Graduation requirements from the program include:

1. Completion of all courses with a grade of B- or better.
2. Graduate project proposal presented to and accepted by the student's Advisory Committee.
3. Completion and defense of graduate project; defense must be accepted by the student's advisory committee.
4. Completion of all required courses and elective courses for a total of 30 credit hours with an average GPA of 3.0 or higher.

The program requires 30 credit hours, consistent with Regent policy.

External Review and Accreditation

The Computer Science Department has an industry advisory board that provided input regarding the types of courses to be offered. The board will continue to play an active role in shaping the curriculum.

Students in the MCS program will play a key role in helping the department review courses and the overall curriculum. Student feedback will be gathered on every course taught in three key categories:

1. Rigor: Did the student feel the course was rigorous enough?
2. Relevance: Did the student find the material and assignments relevant?
3. Practicality: Having finished the course, can the student take the theory that was learned and apply it?

Upon graduation and then again three years after graduation, student feedback will be gathered regarding the overall rigor, relevance, and practicality of the MCS program. This feedback will be used to shape course content, course offerings, and the makeup of the core.

PROJECTED PROGRAM ENROLLMENT AND GRADUATES; PROJECTED DEPARTMENTAL FACULTY/STUDENTS

Data Category	Current – Prior to New Program Implementation	Projected				
		Year 1 (16-17)	Year 2 (17-18)	Year 3 (18-19)	Year 4 (19-20)	Year 5 (20-21)
Data for Proposed Program						
Number of Graduates in Proposed Program	0	0	0	18	18	18
Total # of Declared Majors in Proposed Program	0	20	40	58	58	58
Departmental Data – For All Programs Within the Department						
Total Department Faculty FTE (as reported in Faculty table above)	22	22	23	24	24	24
Total Department Student FTE (Based on Fall Third Week)	506	518	530	535	535	535
Student FTE per Faculty FTE (ratio of Total Department Faculty FTE and Total Department Student FTE above)	23.00	23.54	23.04	22.29	22.29	22.29
Program accreditation-required ratio of Student FTE/Faculty FTE, if applicable: (Provide ratio here:_____)						

Section III: Need

Program Need

Utah County is a rapidly growing area of the state with a large computer industry segment. To support the continued growth of the software sector of the local economy, it is necessary that a continuous supply of people well educated in computer science be readily available. UVU currently has a thriving computer science program that meets part of Utah County's need, but many companies have a strong need for employees with skills beyond the bachelor's degree level.

The proposed Master of Computer Science (MCS) would complement the current undergraduate computer science program and provide additional talent to the high technology employee pool needed in Utah County and in the state of Utah. The Computer Science Department is proposing an MCS rather than a Master of Science in Computer Science as the department's focus is on preparing students to enter the workforce as leaders and innovators rather than focusing on preparing students to conduct basic research. With this relatively low-cost expansion, UVU will be positioned to better accommodate the needs of the local student population. Just as significantly, a UVU MCS degree will enhance the position of the state of Utah in providing an attractive environment for high technology industries.

Labor Market Demand

A report from the Utah Department of Workforce Services that combined Computer and Mathematical jobs into a single category, projected 1,180 annual new jobs in this category with another 610 open jobs from replacement jobs, giving 1,790 total open jobs annually. This results in a 3.2% projected growth rate for Utah as a whole and a four percent growth rate for the Provo-Orem Metropolitan Statistical Area (MSA). By 2022 projections are for Utah to have 48,170 jobs in this category. Of this total only 2,500 jobs come from the mathematical field. All others can be considered computer science or computer science-related jobs. The Provo-Orem MSA is predicted to need 11,050 of these total jobs.

A labor market report compiled by UVU supported the projections of over 1,000 new computer science-related jobs in Utah annually. The report also noted that 2,448 computer science-related jobs over a recent 12 month period required a graduate or professional degree.

The Department of Workforce Services projects annual median compensation in the Provo-Orem metropolitan area for the following computer science-related occupations: $68,670 for Computer Systems Analysts (SOC code 15-1121), $76,380 for Computer Programmers (SOC code 15-1131), and $92,170 for Computer Network Architects (SOC code 15-1143).

Student Demand

A 2012 survey conducted by the UVU CS Department of 239 computer science students revealed that 68% were interested in pursuing a master's degree. This survey also indicated that if UVU offered a Master of Computer Science, 60% of the current computer science students would be interested in pursuing that degree. In the spring of 2015, another survey of a limited set of seniors was conducted. This survey revealed that 75% of the seniors were interested in pursuing a master's degree, but less than ten percent planned to apply immediately. The remaining 90% would defer enrollment a year or two before applying. Follow-up questions with the seniors indicated that the low immediate interest in an MCS at UVU would be most associated with newness of the degree (limited initial course selection, questions about flexibility, and degree focus).

The institution developed predictive enrollment model taking into account immediate enrollment, deferred enrollment, and community enrollment. The predictive model used conservative assumptions and generated an estimated 20 new students a year for the first three years for a total of 60 students in year three of the program.

Similar Programs

The University of Utah offers an MS in Computer Science and an MS in Computing. Utah State University offers an MS in Computer Science. The UVU program is a professional degree and emphasizes applied computer science. It requires a project instead of a thesis. Further, there appears to be sufficient labor market demand and student demand to justify the addition of the UVU program.

Collaboration with and Impact on Other USHE Institutions

The Master of Computer Science is a professional degree program. The purpose of this degree is to prepare students for more advanced roles in professional practice. It is not specifically designed to prepare students for Ph.D. programs. It is expected that the majority of students will come from Utah County, where there is currently no USHE-offered master's degree. Chief academic officers as well as faculty in related departments from the Utah System of Higher Education institutions have reviewed the proposal and have provided input.

Benefits

The Master of Computer Science will provide a learning experience that will prepare students for more advanced computer science projects and will also prepare them for team leadership. The degree gives students practice in designing and developing projects from inception to completion. It provides a graduate-level program in an area of the state where computer technology companies are growing at a rapid rate and where these companies need people prepared at the graduate degree level.

Consistency with Institutional Mission

The mission of the Utah System of Higher Education (USHE) is to provide high quality academic, professional and applied technology learning opportunities designed to advance the intellectual, cultural, social, and economic well-being of the state and its citizens. This program fits well into this mission by applying a higher level of applied technology learning than could be gained from a bachelor’s degree alone.

This program augments the STEM offerings of the institution. The applied nature of the degree correlates with the institution’s commitment to engaged learning.

Section IV: Program and Student Assessment

Program Assessment

The program will be assessed by the Office of Academic Quality Assurance to determine its viability and conformance to the university’s mission, outcomes, strengths, and weaknesses. It will follow the standard schedule and format of assessment of all programs at Utah Valley University. The assessment procedures have been developed in conformance to university policy and Northwest accreditation recommendations.

Assessment will include, but not be limited to, student participation in the program, growth, graduation rates, and conformance to academic standards.

Assessments are conducted and reviewed by the committee of academic assessment, under the direction of the director of Academic Quality Assurance.

Expected Standards of Performance

The program is evaluated using similar procedures that are currently used in the Computer Science Department to meet national accreditation standards. Overall program evaluation includes student key assignments, ratings, and surveys. An important part of the program evaluation is the capstone project, which is the culminating assignment for the program. It demonstrates the students' understanding of all major aspects of the software development lifecycle, and the students' ability to design, develop, and manage complex software projects. In particular, the following project elements will be assessed: completion rate, student performance, size, and complexity. Coursework during the program supports the project and contributes to its completion.

The standards of performance are selected in order to meet the needs of companies who will employ the graduates of the proposed program, with emphasis on local high-tech companies. The standards are based in part on inputs received from these companies about their expectations of highly qualified software professionals.

Students are expected to meet the following program standards:

1. Design of large-scale software systems: To meet this standard, students demonstrate knowledge of common software architectural styles, interaction of design and quality, design tradeoffs, and the role of technology in software design. This outcome addresses the Essential Learning Outcomes of Integrated and Applied Learning, Intellectual and Practical Skills Foundation, and Professional Competency. This standard was selected because many graduates will be expected to fill technical leadership roles as lead designers and architects of large systems.
2. Implementation of large-scale systems: To meet this standard, students demonstrate the ability to write large programs, integrate software modules built over multiple releases, and devise unit and systems tests to ensure the quality of the system. This outcome addresses the Essential Learning Outcomes of Integrated and Applied Learning, Intellectual and Practical Skills Foundation, and Professional Competency. This standard was selected because few companies need software systems measured in hundreds of lines of code; they are measured in thousands, if not hundreds of thousands. For a graduate to take on a leadership role in a company (lead designer/architect), they must fully understand the complexity developers will encounter when implementing a large-scale system.
3. Professional maturity: To meet this standard, students must demonstrate the ability to understand all phases of software lifecycle, take a significant project from conception through delivery without excessive supervision, be able to communicate technical concepts and problems in a coherent and professional manner, and meet deadlines. This outcome addresses the Essential Learning Outcomes of Integrative and Applied Learning, Intellectual and Practical Skills Foundation, People of Integrity, Professional Competency, and Stewards of Place. This standard was selected because companies will expect students as highly qualified software professionals to produce quickly when placed on new problems, be self-motivating, set and meet realistic schedules, and be able to communicate with developers, management, and clients.
4. Broad base of competency: To meet this standard, students must demonstrate a breadth of knowledge that spans multiple functional domains of computer science. This breadth of knowledge must be deep enough that a student can apply their problem-solving skills to multiple domains or use multiple domains to solve a single problem. This outcome addresses the Essential Learning Outcomes of Integrative and Applied

Learning, Intellectual and Practical Skills Foundation, Stewards of Place, and Knowledge Foundation. This standard was selected because the problems graduates will be asked to solve can vary widely and often require skills in many different domains of computer science to successfully be solved.

Section V: Finance

Department Budget

Three-Year Budget Projection							
Departmental Data	Current Departmental Budget - Prior to New Program Implementation	Departmental Budget					
		Year 1 (2016-17)		Year 2 (2017-18)		Year 3 (2018-19)	
		Addition to Budget	Total Budget	Addition to Budget	Total Budget	Addition to Budget	Total Budget
Personnel Expense							
Salaries & Wages	$1,450,489	$96,950	$1,547,439	$85,000	$1,632,439	$56,100	$1,688,539
Benefits	$610,414	$31,191	$641,605	$40,539	$682,144	$24,776	$706,920
Total Personnel Expense	$2,060,903	$128,141	$2,189,044	$125,539	$2,314,583	$80,876	$2,395,459
Non-personnel Expense							
Travel	$0	$1,500	$1,500	$1,500	$3,000	$1,500	$4,500
Capital	$0	$0	$0	$0	$0	$0	$0
Library	$0	$0	$0	$0	$0	$0	$0
Current Expense	$33,303	$30,000	$63,303	-$10,000	$53,303	$5,000	$58,303
Total Non-personnel Expense	$33,303	$31,500	$64,803	-$8,500	$56,303	$6,500	$62,803
Total Expense (Personnel + Current)	$2,094,206	$159,641	$2,253,847	$117,039	$2,370,886	$87,376	$2,458,262
Departmental Funding		Year 1 (2016-17)		Year 2 (2017-18)		Year 3 (2018-19)	
Appropriated Fund	$2,094,206	$132,761	$2,226,967	$90,159	$2,317,126	$75,280	$2,392,406
Other:							
Special Legislative Appropriation							
Grants and Contracts							
Special Fees/Differential Tuition		$26,880	$26,880	$26,880	$53,760	$12,096	$65,856
Total Revenue	$2,094,206	$159,641	$2,253,847	$117,039	$2,370,886	$87,376	$2,458,262
Difference							
Revenue - Expense	$0	$0	$0	$0	$0	$0	$0
Departmental Instructional Cost/Student Credit Hour* (as reported in institutional Cost Study for "current" and using the same Cost Study Definition for "projected")	$207		$218		$224		$230

* Projected Instructional Cost/Student Credit Hour data contained in this chart are to be used in the Third-Year Follow-Up Report and Cyclical Reviews required by R411.

Funding Sources
Funding to support program costs will come from differential tuition and new appropriations.

Note that because of the demand among local companies for employees with master's degrees, it is believed these companies are potential funding sources. Gifts and grants from them will be used to strengthen the program. However, this funding source was not included at this time because such funds have not yet been committed.

Reallocation
The program will not be supported through internal reallocation.

Impact on Existing Budgets
The cost of the program will not be absorbed within any current base budgets, and as such the program will not financially impact other programs.

Section VI: Program Curriculum

Course Prefix and Number	Title	Credit Hours
Required Courses		
CS 6510	Design and Simulation of Operating Systems	3
CS 6700	Advanced Mathematics for Computer Science	3
CS 6400	Modern Databases	3
CS 6300	Software Engineering Leadership	3
CS 6500	Software Architecture	3
CS 6150	Advanced Algorithms	3
CS 6600	Graduate Project I	3
CS 6610	Graduate Project II	3
	Sub-Total	24
Elective Courses	Pick two courses:	
CS 6470	Machine Learning	3
CS 6620	Advanced Data Mining and Visualization	3
CS 6730	Advanced Embedded Systems Engineering	3
CS 6800	Computer Graphics	3
	Or other departmental approved electives	
	Sub-Total	6
	Total Number of Credits	30

Program Schedule
Due to the professional nature of the MCS, it is expected that few students will be full-time graduate students. As a result, the MCS has been set up around a three-year schedule vs. a two-year schedule. An alternative two-year option will be shown, but it will only be implemented if there is sufficient student demand in the second year and adequate faculty staffing.

Fall of First Year (Course Prefix and Number))	Course Title	Credit Hours
CS 6510	Design and Simulation of Operating Systems	3
CS 6300	Software Engineering Leadership	3
	Semester total:	6

Spring of First Year (Course Prefix and Number)	Course Title	Credit Hours
CS 6400	Modern Databases	3
CS 6700	Advanced Mathematics for Computer Science	3
	Semester total:	6
Fall of Second Year (Course Prefix and Number)	Course Title	Credit Hours
CS 6500	Software Architecture	3
Elective	MCS Elective Course	3
	Semester total:	6
Spring of Second Year (Course Prefix and Number)	Course Title	Credit Hours
CS 6150	Advanced Algorithms	3
Elective	MCS Elective Course	3
	Semester total:	6
Fall of Third Year (Course Prefix and Number)	Course Title	Credit Hours
CS 6600	Graduate Project I	3
	Semester total:	3
Spring of Third Year (Course Prefix and Number)	Course Title	Credit Hours
CS 6610	Graduate Project II	3
	Semester total:	3

Two-Year Option: This option will only be used if there is sufficient student demand and adequate faculty staffing.

Fall of First Year (Course Prefix and Number)	Course Title	Credit Hours
CS 6510	Design and Simulation of Operating Systems	3
CS 6300	Software Engineering Leadership	3
	Semester total:	6
Spring of First Year (Course Prefix and Number)	Course Title	Credit Hours
CS 6400	Modern Databases	3
CS 6700	Advanced Mathematics for Computer Science	3
	Semester total:	6

Fall of Second Year (Course Prefix and Number)	Course Title	Credit Hours
CS 6500	Software Architecture	3
Elective	MCS Elective Course	3
CS 6600	Graduate Project I	3
	Semester total:	9
Spring of Second Year (Course Prefix and Number)	Course Title	Credit Hours
CS 6150	Advanced Algorithms	3
Elective	MCS Elective Course	3
CS 6610	Graduate Project II	3
	Semester total:	9

Section VII: Faculty

The following faculty members are being proposed as Graduate Faculty under UVU policy 655.

Al-Ghaib, Huda (2015) Assistant Professor, Utah Valley University, College of Technology and Computing. Al-Gahib received her undergraduate degree in computer engineering from the University of Technology in Baghdad-Iraq in 2006. She worked in the Ministry of Higher Education and Scientific Research from 2007-2009. She is a recipient of a Fulbright Scholar in 2009 for which she earned her Master in Electrical Engineering in 2011 from the University of Alabama in Huntsville (UAH) and the Ph.D. in Electrical Engineering from the same institute in 2015. During her graduate studies at UAH she was awarded outstanding graduate student in engineering in 2014. Dr. Al-Ghaib's research interests are in the area of pattern recognition and data mining with applications in medical imaging. She is the author/co-author of more than ten journal and conference articles. She is a member of IEEE.

Christ, Beau (2015): Assistant Professor, Utah Valley University, College of Technology and Computing since 2015; Ph.D. Computer Science, University of Nebraska-Lincoln; B.S. Honors Computer Science & Mathematics, Doane College. Professor Christ was the recipient of the 2009 Doane College Information Science & Technology Excellence Award, as well as the 2014 UNL Outstanding Graduate Teaching Assistant Award in the College of Engineering. He has authored distance education courses in introductory computer science and Unix programming, serves on the UVU Council on Admission, Graduation, & Academic Standards, and is a member of the ACM. He specializes in computer vision, machine learning, MATLAB, and Swift software development. Professor Christ teaches discrete mathematics, computer ethics, and numerical software engineering.

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