TAB C

UTAH SYSTEM OF
HIGHER EDUCATION
Building a Stronger State of Minds

January 11, 2017

MEMORANDUM

TO: State Board of Regents

FROM: David L. Buhler

SUBJECT: University of Utah – Master of Software Development

Issue

The University of Utah requests approval to offer a Master of Software Development effective Fall Semester, 2017. The proposed program was approved by the institutional Board of Trustees December 13, 2016.

Background

Software Development is an occupation that is in high demand within Utah as well as nationwide. Industry leaders are unable to hire enough people from within the state to fill available positions. This proposal seeks to broaden the talent pool of people prepared to work as software developers and in related occupations by designing the curriculum to accommodate qualified students with baccalaureate degrees in non-technical areas. This is a professional degree with the primary purpose of preparing people for professional positions in industry. Admission to the program will occur on an annual basis with students admitted into a cohort group. Students will attend classes each semester, including summers, and by doing so will be able to complete the full program in approximately 18 months.

The Utah Department of Workforce Services Occupational Explorer shows the Software Developers occupational group as having strong labor market demand. Statewide projections for software development show the following 2014 - 2024 labor market data:

SOC Code	Occupation	Annual Percent Change in Job Openings	Total Annual Openings	Hourly Median Wage
15-1132	Software Developers, Applications	5.9	640	$43.96
15-1133	Software Developers, Systems Software	4.3	170	$44.63

THE UNIVERSITY OF UTAH   UtahStateUniversity   WEBER STATE UNIVERSITY   SUU SOUTHERN UTAH UNIVERSITY   SNOW COLLEGE   DSU DIXIE STATE UNIVERSITY   UVU UTAH VALLEY UNIVERSITY   Salt Lake Community College

Policy Issues

The program is comprised of ten four-credit-hour courses for a total of 40 credit hours. Regent Policy R401 specifies that master degree programs should require no more than 36 credit hours, but provides for additional credits if required for accreditation. There are not accreditation requirements specifying that this program should require 40 hours. However, because the program is designed for students who have no formal preparation in software development or related fields, additional time is needed to ensure that graduates are appropriately prepared and can contribute professionally to the occupation. Because of this and because the program's scheduling format enables completion within 18 months, staff recommends that an exception be approved by the Board of Regents to allow this program to require 40 credit hours.

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.

Commissioner's Recommendation

The Commissioner recommends the Board of Regents approve the Master of Software Development and grant an exception so that the institution may require 40 credit hours for program completion.

_____
David L. Buhler
Commissioner of Higher Education

DLB/BKC
Attachment

Section I: The Request

University of Utah requests approval to offer the following Master's degree(s): Master of Software Development effective Fall 2017. This program was approved by the institional Board of Trustees on .

Section II: Program Proposal

Program Description
Present a complete, formal program description.

The educational mission of the proposed Master of Software Development (MSD) degree program in the School of Computing at the University of Utah is to prepare students with bachelor degrees in various non-technical backgrounds to be well versed in computer and software fundamentals, to be technically proficient in software development, and to be responsive to the needs of local industry. This new program will help meet the critical state and national need for highly capable software developers and also help create new, high-paying, job opportunities for students with degrees or backgrounds that may be limiting their current potential.

The MSD curriculum stresses significant hands-on teaching and an immersive learning environment, which will prepare students to become competent software developers who, as lifelong learners, will be able to effectively adapt to the ever-changing demands of the increasingly digital world, and pursue additional training and/or certifications to expand their expertise. The MSD program will use active-learning, project-oriented approaches to equip students with tools and perspectives for problem solving while honing their critical thinking skills that transcend specific software languages or applications.

The salient features of the MSD program include but are not limited to the following:

• Produce a high quality workforce of software developers.

• Emphasize immersion, teamwork, and leadership in software development through in-person classroom and lab training. Will create or use existing online resources (including partnering with online education companies) for appropriate learning objectives.

• Incorporate active-learning and project-oriented approaches, to develop skills and a portfolio of open-source, software credentials.

• Include interdisciplinary projects that teach students how to apply software skills in a variety of application domains.

• Establish close collaboration with industry. Recruit domain experts to teach the practice of software development. Facilitate recruitment of program students.

• The duration of the MSD program is 18 months (Fall/Spring/Summer/ Fall) involving classroom teaching and extensive lab and project experiences.

The technical content covered in the MSD program will be divided into interconnected units emphasizing both fundamental principles and concepts and practice of software development. Very importantly, robust design, security, and reliability will be the cornerstone of the technical content spanning computer/device hardware and software, programming languages, data

structures and algorithms, operating systems, networking, architecture, software practice, data analytics and visualization, and frontend and backend systems. The technical content will be strengthened with the help of hands on assignments, and case studies in current and emerging technologies including Internet of Things, Cloud Computing, Mobile Computing, Big Data, among others.

The MSD program is comprised of 9 required courses and one required MSD project, 4 credit hours each, for a total of 40 credit hours. There are no electives. Students admitted to the program every fall semester move together as cohorts for the duration of the program.

The School of Computing faculty (on 04/08/2016) and the College of Engineering Curriculum Committee (on 04/11/2016) , with a majority vote, have consented to move the proposal forward.

Consistency with Institutional Mission

Explain how the program is consistent with the institution's Regents-approved mission, roles, and goals. Institutional mission and roles may be found at higheredutah.org/policies/policyr312/ .

The MSD program will meet the University of Utah mission by serving the people of Utah through application and dissemination of knowledge. The new program will expand the portfolio of the School of Computing and the University of Utah and help boost this leadership role. It has the potential to attract newer businesses to Utah that require high quality software development.

Section III: Needs Assessment

Program Rationale

Describe the institutional procedures used to arrive at a decision to offer the program. Briefly indicate why such a program should be initiated. State how the institution and the USHE benefit by offering the proposed program.

The Governor's Office of Economic Development triggered the discussions on the new MSD program in the summer of 2015. Since then there have been several discussions on the need for this program, its structure, and its finances involving the School of Computing faculty, the Dean of College of Engineering, office of the Vice President of the University of Utah, the industry advisory boards of the School of Computing and the College of Engineering, and the Utah Technology Council.

The MSD program would help meet the critical state and national need for highly capable software developers and also create new, high-paying, job opportunities for students with degrees or backgrounds that may be limiting their current potential. The demand for software engineers is much more than the computer science degrees that are awarded each year in the United States. The MSD program by reaching out to non-CS majors, will recruit an untapped demographic to meet this demand.

Students from other USHE institutions will also benefit from the MSD program. A pipeline of students for the MSD program from other USHE institutions will be established through collaborations.

Labor Market Demand

The MSD program will train students from non-CS backgrounds to allow them to obtain better jobs while also meeting the growing need for software developers in industry. According to the United States Department of Labor, employment of software developers is projected to grow 22 percent in a recession-resistant manner from 2012 to 2022, much faster than the average for all other occupations. The main reason for the rapid growth is a large increase in the demand for computer software. The Utah Technology Council estimates that there are 14,000 current opening for workers with a baccalaureate degree or higher in engineering or computer science in Utah. Furthermore, the number of unfilled positions is expected to grow more in the future. Many industries including the auto-industry, healthcare, defense, and online banking among many others are increasingly relying on software and have full-fledged software divisions.

A key element of the MSD program is its close industry involvement. Besides helping to teach some of the MSD classes, industry colleagues will be involved in evaluating and critiquing student work. This will expose students to current industry trends and practices. Students will work with MSD faculty and industry colleagues on resumé building and improving job interview skills.

Student Demand

The University of Pennsylvania at Philadelphia has a program similar to the MSD program called Master of Computer and Information Technology (MCIT). This program is in high demand with a 10% (approximately) acceptance rate. In general, the student demand for a Master's degree in computer science/computing related fields is high. This is evident in the existing MS programs in the School of Computing that receive close to 600 applications every year. Some of these applications are not found suitable because of lack of a thorough Computer Science or related background. These students, who are otherwise strong, would be good candidates for the MSD program. The new MSD program will generate wide-scale interests among both domestic and international students of different disciplines especially given the high and growing demand for computer related workers.

Similar Programs

There is no Master's level degree program in Utah in Software Development for non-Computer Science students. The MSD degree is designed for non-Computer Science majors or even those with non-technical majors. The School of Business at the University of Utah offers an Master of Science in Information Systems (MSIS) and a graduate certificate in Information Systems. The MSIS and graduate certificate in information systems programs are intended to prepare students for business careers where an understanding of technology is of financial and strategic

value to a firm. The MSIS program focuses on producing information systems executives, analysts and specialists with business management skills to align information technology with business strategy. The new MSD degree offered by the School of Computing will produce high quality software developers by focusing on teaching hard software design and development skills. The courses in MSIS and MSD, even with similar sounding names, thus have different content. Furthermore, the MSIS and MSD degrees, like the School of Business and the School of Computing, serve different markets. Therefore, the MSD degree is distinct from the MSIS degree.

There are primarily three other categories of software training programs for non-CS majors.
• Short-term boot camps focused on very specific skills
• Remedial programs followed by a regular MS degree in Computer Science
• Online programs that offer a variety of courses and modules from which students can learn at their own pace.

The short-term boot camps do not provide college credentials but are useful in teaching specific skills. The remedial program approach requires about a year of remedial courses followed by a regular MS degree. This approach would take significantly longer than the 18 month MSD degree. The online programs do not offer a comprehensive immersive and cohort experience that the new MSD program offers. The MSD program approach of using online resources as necessary allows incorporating the benefits of the boot camps as well as those of the online programs.

Collaboration with and Impact on Other USHE Institutions

Indicate if the program will be delivered outside of designated service area; provide justification. Service areas are defined in higheredutah.org/policies/policyr315/ . Assess the impact the new program will have on other USHE institutions. Describe any discussions with other institutions pertaining to this program. Include any collaborative efforts that may have been proposed.

The MSD program will not be delivered outside of the institution's designated service area. The MSD program should have no adverse impact on other USHE institutions. None of the other USHE institutions offer a similar program. However, students from other USHE are likely to enroll in the MSD program. A pipeline of students for the MSD program from other USHE institutions will be established through collaborative efforts.

External Review and Accreditation

Indicate whether external consultants or, for a career and technical education program, program advisory committee were involved in the development of the proposed program. List the members of the external consultants or advisory committee and briefly describe their activities. If the program will seek special professional accreditation, project anticipated costs and a date for accreditation review.

Program content was informed from similar programs that meet industry needs for software developers.

Section IV: Program Details

Graduation Standards and Number of Credits

Provide graduation standards. Provide justification if number of credit or clock hours exceeds credit limit for this program type described in R401-3.11, which can be found at higheredutah.org/policies/R401.

To receive the MSD degree, a student must:
• Complete the required 40 hours of coursework.
• Receive at least a 3.0 GPA for the entire program.
• Receive no less than a B- in any of the program courses.
• Receive a B grade or higher in the MSD Project.

Given the need for covering both basic and advanced content students will be taking more credit hours than a typical master degree program. This is required to ensure students are prepared for a professional position in the software industry.

Admission Requirements
List admission requirements specific to the proposed program.

The admission requirements for the MSD degree will be different from those of other programs within the School of Computing. The key difference is that for the MSD degree only students with little or no Computer Science or related backgrounds will be admitted. However, the applicants to the MSD program must demonstrate problem solving skills and the ability to reason mathematically and logically through undergraduate or higher level courses in one or more of the following: Calculus, Probability Theory, or Statistics (examples of courses at the University of Utah that would satisfy this requirement include MATH 1100, 1170, 1210, ECON 3620, 3640, or PSY 3000). All students will be required to have valid Gaduate Record Examination (GRE) scores (the GRE requirement could be waived in very few cases for domestic students who are able to demonstrate verbal, quantitative, and analytical abilities through other verifiable means). All international students will be required to take the TOEFL or the IELTS exam. The MSD program admission process and requirements are as follows.
• School of Computing MSE Online Application
• GRE Test Score: An official GRE test score is required for all MSE applications. There are no minimum GRE scores required for application. Applicants are encouraged to meet overall program GRE averages, but all application materials are evaluated to determine the strength of the application.
• Transcripts/GPA: This requirement includes a list all colleges and universities applicants have attended including the University of Utah, regardless of length of attendance. Official transcripts from each institution will be required. A minimum cumulative 3.0 undergraduate GPA is required for admission. The transcripts should include courses that demonstrate the ability to reason mathematically and logically.
• Three Letters of Recommendation
• One statement-of-purpose essay, describing the applicant's intent and goals for joining the program
(submitted within the online application).
• Resume
• English Language Proficiency: International applicants must receive a minimum score of 90 on the TOEFL exam or 6.5 on the IELTS exam.

Curriculum and Degree Map
Use the tables in Appendix A to provide a list of courses and Appendix B to provide a program Degree Map, also referred to as a graduation plan.

Section V: Institution, Faculty, and Staff Support

Institutional Readiness
How do existing administrative structures support the proposed program? Identify new organizational structures that may be needed to deliver the program. Will the proposed program impact the delivery of undergraduate and/or lower-division education? If yes, how?

The MSD program will be a part of the offerings of the School of Computing under the College of Engineering. The international reputation of the School in undergraduate and graduate training, as well as world-class research, will help attract the very best students from within Utah and beyond. It will also help recruitment of MSD graduates into professional positions. Research-active faculty are part of the team managing and running the MSD program, and they know the trends in computer science, software engineering, and software development. One of the School of Computing faculty members will serve as the director of the MSD program. The MSD program will be taught with the help of additional teaching faculty specially recruited in the School of Computing for this program. The MSD program will also recruit domain experts from industry as adjunct faculty to teach the practice of software development. Given that new teaching faculty will be recruited for the MSD program, it will have no impact on the delivery of the undergraduate or graduate education in the School of Computing.

Faculty
Describe faculty development activities that will support this program. Will existing faculty/instructions, including teaching/ graduate assistants, be sufficient to instruct the program or will additional faculty be recruited? If needed, provide plans and resources to secure qualified faculty. Use Appendix C to provide detail on faculty profiles and new hires.

The MSD program will be taught with the help of additional teaching faculty specially recruited in the School of Computing for this program. The MSD program will also recruit domain experts from industry as adjunct faculty to teach the practice of software development. The School of Computing faculty will manage the MSD program.

Staff
Describe the staff development activities that will support this program. Will existing staff such as administrative, secretarial/ clerical, laboratory aides, advisors, be sufficient to support the program or will additional staff need to be hired? Provide plans and resources to secure qualified staff, as needed.

The MSD program will recruit two staff members – an academic advisor, and an administrative assistant. The program will also obtain career, lab, and computing, services for its students. The finances needed for recruiting these personnel and services are a part of the overall MSD program expense budget.

Student Advisement
Describe how students in the proposed program will be advised.

Students in the MSD program will work closely with the program faculty including the director of the program. One of the MSD program faculty members will serve as the chair of each

student's MSD project supervisory committee. In consultation with the supervisory committee chair, the student will select two additional faculty members with another member from the School of Computing and a third member from the School of Computing or any other department at the University of Utah. Students will also receive career advice from program faculty, associate instructors from industry, as well as career services.

Library and Information Resources
Describe library resources required to offer the proposed program if any. List new library resources to be acquired.
Library holdings are currently in place to support the program.

Projected Enrollment and Finance
Use Appendix D to provide projected enrollment and information on related operating expenses and funding sources.

Section VI: Program Evaluation

Program Assessment
Identify program goals. Describe the system of assessment to be used to evaluate and develop the program.
Expected Learning Outcomes:
– To have a comprehensive view of both the fundamental concepts as well as the practice of software design and development
– To demonstrate mastery of software design and development, specifically to be able to write secure, reliable and robust code
– To be able to apply software skills to different application areas
– To demonstrate critical thinking skills transcending specific software languages or applications
– To be able to work as members of, and also be able to lead, teams for software design and development

Student Learning Assessment:
– The student demonstrates knowledge and technical skills in classes with a 3.0 or higher cumulative GPA.
– The student is effective in integrating this knowledge in a real world project by achieving a B or higher letter grade in the MSE project.
– The student is effective with analytical and critical thinking as measured using assignments or projects in program coursework.
– The student is effective with teamwork and leadership as measured using group projects in the program of study.
– The student is effective with written and oral communication measured using assignments, project writing, and presentations in classes.

Program Assessment
The program is not subject to a specific agency accreditation; however, in addition to the program reviews mandated by the graduate school, the steering committee will conduct an

informal review of the program at the conclusion of each of the first five academic years the degree is in place. Use of the steering committee enables internal review by current University of Utah faculty and external advice and consultation. In addition, listed here are several goals and measures the program will use to determine if program objectives are being met.

Recruiting, Admission, and Retention:
• Goals – to recruit high-caliber applicants and retain students in quantities that meet or exceed the five-year program size projections, to graduate 95% of the students admitted who meet the learning goals of MSD.
• Measures – applicant pool size and program size, # of applicants recruited per recruiting channel/event, average GPA of applicants and of students, # of applicants, and students by most recent location and degree/institution, # of students graduating from the MSD program
Placement:
• Goals – to help MSD graduates obtain career opportunities that leverage the knowledge gained in the program.
• Measures - number of positions, skills used, companies and industry as well as average salaries received.
Student Evaluation:
• Goals – to assure positive student and graduate perceptions of program design, study benefits, and quality of cohort for improvement of the MSD program.
• Measures – summaries of students mid-study, exit, and alumni interviews/surveys.
External Evaluation:
• Goals – to acquire positive perceptions of students and graduates by recruiters, guest speakers, project sponsors and coordinators for MSD students for improvement of the MSD program.
• Measures – summaries of external surveys.
Financial:
• Goals – to meet or exceed the revenue projection.
• Measures – Student credit hours, revenues from the MSD tuition.

Student Standards of Performance

List the standards, competencies, and marketable skills students will have achieved at the time of graduation. How and why were these standards and competencies chosen? Include formative and summative assessment measures to be used to determine student learning outcomes.

Outcome standards established by the steering committee will be used to assess student learning, knowledge, and skills. All students in the MSD degree program are required to take and successfully pass all the courses. Through these courses the students will acquire applied skills for a career in industry with tools and perspectives for problem solving while honing critical thinking skills that transcend specific software languages or applications. Students will obtain a cohort experience that simulates working as teams in industry. Students will be expected to manage priorities and demonstrate progress in meeting degree requirements by appropriately completing assignments and programs responsibilities. Students must maintain a 3.0 GPA throughout their program. Furthermore, grades lower than a 'B-' will not be counted toward degree credit. A grade of B or higher is required for the MSD project. Under normal

circumstances, the MSD program will be completed in an 18-month period, three semesters and one summer term.

Appendix A: Program Curriculum

List all courses, including new courses, to be offered in the proposed program by prefix, number, title, and credit hours (or credit equivalences). Indicate new courses with an X in the appropriate columns. The total number of credit hours should reflect the number of credits required to be awarded the degree.

For variable credits, please enter the minimum value in the table for credit hours. To explain variable credit in detail as well as any additional information, use the narrative box at the end of this appendix.

Course Number	NEW Course	Course Title	Credit Hours
General Education Courses (list specific courses if recommended for this program on Degree Map)			
		General Education Credit Hour Sub-Total	0
Required Courses			
CS6xxx	X	Introduction to Software Development	4
CS6xxx	X	Computer Programming	4
CS6xxx	X	Data Structures and Algorithms	4
CS6xxx	X	Systems I	4
CS6xxx	X	Systems II	4
CS6xxx	X	Software Engineering	4
CS6xxx	X	Data Analytics and Visualization	4
CS6xxx	X	Database Systems and Applications	4
CS6xxx	X	Application System Design	4
CS6xxx	X	Master of Software Development Project	4
		Required Course Credit Hour Sub-Total	40
Elective Courses			
		Elective Credit Hour Sub-Total	0
		Core Curriculum Credit Hour Sub-Total	40

Program Curriculum Narrative

Describe any variable credits. You may also include additional curriculum information.

There are no variable credits in the MSD program.

Degree Map

Fall Yr1:
• Introduction to Software Development
• Computer Programming
• Data Structures and Algorithms

Spring Yr1:
• Systems 1
• Systems 2
• Software Engineering

Summer Yr1:
• Data Analytics and Visualization
• Database Systems and Applications

Fall Yr2:
• Application System Design
• Master of Software Development Project

Appendix C: Current and New Faculty / Staff Information

Part I. Department Faculty / Staff

Identify # of department faculty / staff (headcount) for the year preceding implementation of proposed program.

	# Tenured	# Tenure -Track	# Non -Tenure Track
Faculty: Full Time with Doctorate	24	12	8
Faculty: Part Time with Doctorate	1	0	0
Faculty: Full Time with Masters	0	0	0
Faculty: Part Time with Masters	0	0	0
Faculty: Full Time with Baccalaureate	0	0	0
Faculty: Part Time with Baccalaureate	0	0	0
Teaching / Graduate Assistants	////////	////////	116
Staff: Full Time			11
Staff: Part Time			4

Part II. Proposed Program Faculty Profiles

List current faculty within the institution -- with academic qualifications -- to be used in support of the proposed program(s).

	First Name	Last Name	Tenure (T) / Tenure Track (TT) / Other	Degree	Institution where Credential was Earned	Est. % of time faculty member will dedicate to proposed program.	If "Other," describe
Full Time Faculty							
	Sneha	Kasera	T	PhD	University of Massachusetts	50	
Part Time Faculty							

Part III: New Faculty / Staff Projections for Proposed Program

Indicate the number of faculty / staff to be hired in the first three years of the program, if applicable. Include additional cost for these faculty / staff members in Appendix D.

	# Tenured	# Tenure -Track	# Non -Tenure Track	Academic or Industry Credentials Needed	Est. % of time to be dedicated to proposed program.
Faculty: Full Time with Doctorate			3	High performer academically with at least some industry [+]	100
Faculty: Part Time with Doctorate					
Faculty: Full Time with Masters					
Faculty: Part Time with Masters			6	2 Associate Instructors per year with several years of industry [+]	
Faculty: Full Time with Baccalaureate					
Faculty: Part Time with Baccalaureate					
Teaching / Graduate Assistants	////////	////////	26	8 TAs in the first year and 9 TAs each in years 2 and 3. The TAs [+]	50
Staff: Full Time					
Staff: Part Time			2	An Academic Advisor and an Administrative Assistant	50

Appendix D: Projected Program Participation and Finance

Part I.
Project the number of students who will be attracted to the proposed program as well as increased expenses, if any. Include new faculty & staff as described in Appendix C.

Three Year Projection: Program Participation and Department Budget						
	Year Preceding Implementation	New Program				
		Year 1	Year 2	Year 3	Year 4	Year 5
Student Data						
# of Majors in Department						
# of Majors in Proposed Program(s)	/////////	40	40	40	40	40
# of Graduates from Department	267	270	270	270	270	270
# Graduates in New Program(s)	/////////	40	80	80	100	120
Department Financial Data						
		Department Budget				
		Year 1	Year 2	Year 3		
Project additional expenses associated with offering new program(s). Account for New Faculty as stated in Appendix C, "Faculty Projections."	Year Preceding Implementation (Base Budget)	Addition to Base Budget for New Program(s)	Addition to Base Budget for New Program(s)	Addition to Base Budget for New Program(s)		
EXPENSES – nature of additional costs required for proposed program(s)						
List salary benefits for additional faculty/staff each year the positions will be filled. For example, if hiring faculty in year 2, include expense in years 2 and 3. List one-time operating expenses only in the year expended.						
Personnel (Faculty & Staff Salary & Benefits)		$764,400	$965,000	$994,000		
Operating Expenses (equipment, travel, resources)		$180,000	$188,500	$190,300		
Other:						
TOTAL PROGRAM EXPENSES	/////////	$944,400	$1,153,500	$1,184,300		
TOTAL EXPENSES	$0	$944,400	$1,153,500	$1,184,300		
FUNDING – source of funding to cover additional costs generated by proposed program(s)						
Describe internal reallocation using Narrative 1 on the following page. Describe new sources of funding using Narrative 2.						
Internal Reallocation						
Appropriation		$728,123	$848,943	$895,661		
Special Legislative Appropriation						
Grants and Contracts						
Special Fees		$115,877	$174,457	$153,839		
Tuition						
Differential Tuition (requires Regents approval)		$100,400	$130,100	$134,800		
PROPOSED PROGRAM FUNDING	/////////	$944,400	$1,153,500	$1,184,300		
TOTAL DEPARTMENT FUNDING	$0	$944,400	$1,153,500	$1,184,300		
Difference						
Funding - Expense	$0	$0	$0	$0		

Part II: Expense explanation

Expense Narrative
Describe expenses associated with the proposed program.
Year 1:
The personnel expenses include
• 12 months salary + 38% benefits for two new teaching faculty recruited specially for this program
• 50% salary + 38% benefits for the Director of the program (a faculty member from the School of Computing)
• One semester salary + 8% benefits for 8 Teaching Assistants (for the 8 courses taught in the Fall, Spring, and Summer terms of first year)
• $25,000 +50% benefits for 2 associate instructor from industry
• $40,000 + 50% benefits for an administrative assistant
• $50,000 + 50% benefits for an academic advisor (also responsible for admissions)

Operating expenses include
• $15,000 for career services
• $56,000 for laptops for 40 students ($1,400 per laptop per student, students pay this as a part of the Special Fees, students get to retain their laptop after completing the program)
• $4,000 for software for 40 students ($100 per student, students pay this as a part of the Special Fees, students keep the software on their laptop subject to the terms and conditions of the software)
• $20,000 for access to online resources for 40 students ($500 per student, students pay this as a part of the Special Fees)
• $40,000 for computing services
• $15,000 for other lab equipment, maintenance, cloud service access fee, etc.
• $25,000 for advertisement of the MSD program
• $5,000 for supplies

Year 2:
Changes from the Year 1 expenses:
• 12 month salary + 38% benefits for an additional new teaching faculty
• 1 semester salary + 8% benefits for one additional Teaching Assistant (responsible for the Application System Design course for the second year students in the program)
• 4% salary increase for all personnel from Year 1 to account for inflation
• $6,680 for access to online resources for 40 second-year students for 4 additional months ($167 per student, students pay this as a part of the Special Fees)

Year 3:
The increase is only due to 3% salary increase for all personnel from Year 2 to account for inflation. No change in operational cost.

Part III: Describe funding sources

Revenue Narrative 1
Describe what internal reallocations, if applicable, are available and any impact to existing programs or services.
The standard Engineering Differential Tuition assessed as part of the student credit hours associated with this program will be returned 100% (less any applicable bank charges) to help offset the costs of the program. In addition, the Senior Vice President Academic Affairs office and the Dean of the College of Engineering are willing to jointly help offset any unforeseen contingencies that might arise. It is not expected that this program will materially impact existing programs or services.

Revenue Narrative 2

We have reviewed the revenue model with the Associate VP of Budget and Planning. The revenue has been computed considering a total of 40 new students joining the program in the Fall semester every year from 2017 to 2019. Each student in the MSD program will pay an amount of $41,000 (Cohort 1) to cover mandatory student fees, tuition and program special fees. The special fees are for recovering the cost of laptops, software, and online resources as described in the expense narrative. The program assessment for students in Cohort 2 are calculated to be $42,000 for the four semester program and $43,000 for students in Cohort 3. The amount paid by the students of the MSD program will be sufficient to meet the expenses of the program as well as the expenses of the University.