7-20-2017

Educational Policies Committee Program Proposal, College of Science, July 20, 2017

Utah State University

Utah System of Higher Education
New Academic Program Proposal
Cover/Signature Page - Full Template

Institution Submitting Request:	Utah State University
Proposed Program Title:	Master of Data Analytics
Sponsoring School, College, or Division:	Huntsman School of Business, College of Science
Sponsoring Academic Department(s) or Unit(s):	Department of Mathematics and Statistics, Department of Management Information Systems, Department of Economics and Finance
Classification of Instructional Program Code[1] :	27.05, 52.13
Min/Max Credit Hours Required of Full Program:	33 / 33
Proposed Beginning Term[2]:	Fall 2017
Institutional Board of Trustees' Approval Date:	03/03/17

Program Type (check all that apply):

☐ (AAS)	Associate of Applied Science Degree
☐ (AA)	Associate of Arts Degree
☐ (AS)	Associate of Science Degree
☐	Specialized Associate Degree (specify award type[3]:)
☐	Other (specify award type[3]:)
☐ (BA)	Bachelor of Arts Degree
☐ (BS)	Bachelor of Science Degree
☐	Specialized Bachelor Degree (specify award type[3]:)
☐	Other (specify award type[3]:)
☐ (MA)	Master of Arts Degree
☐ (MS)	Master of Science Degree
☒	Specialized Master Degree (specify award type[3]: Professional Master's degree)
☐	Other (specify award type[3]:)
☐	Doctoral Degree (specify award type[3]:)
☐	K-12 School Personnel Program
☐	Out of Service Area Delivery Program

[1] For CIP code classifications, please see http://nces.ed.gov/ipeds/cipcode/Default.aspx?y=55.
[2] "Proposed Beginning Term" refers to first term after Regent approval that students may declare this program.
[3] Please indicate award such as APE, BFA, MBA, MEd, EdD, JD

Chief Academic Officer (or Designee) Signature:

I, the Chief Academic Officer or Designee, certify that all required institutional approvals have been obtained prior to submitting this request to the Office of the Commissioner.

Edward M. Reeve

Date: April 19, 2017

☒ I understand that checking this box constitutes my legal signature.

Utah System of Higher Education
Program Description - Full Template

Section I: The Request

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

Section II: Program Proposal

Program Description

Present a complete, formal program description.

The purpose of the Master of Data Analytics (MDATA) program is to train the next generation of statisticians, business analysts, and computer scientists to meet the demand for individuals with data management and analysis skills in Utah and the United States. The program integrates coursework in Mathematics and Statistics, Management Information Systems, Economics and Finance, and Computer Science, to give graduates a broad but focused collection of tools for the management and analysis of data.

Data Analytics represent relatively new employment designations that have emerged rapidly out of critical necessity. As summarized by one report from the White House Big Data Initiative, this need is becoming more acute "as the collection, storage, and analysis of data continues on an upward and seemingly boundless trajectory, fueled by increases in processing power, the cratering costs of computation and storage, and growing number of sensor technologies embedded in devices of all kinds" (see *Big Data: Seizing Opportunities, Preserving Values*).

The current shortage of data scientists and analysts reflects the relatively broad skills required by potential employers, both in research and industry. This motivates the underlying objectives of this program: to prepare students through cross-disciplinary training to (1) use modern programming languages, algorithms, and database tools to build, clean, manage, and process large datasets, and to analyze them as efficiently as possible; (2) understand both conventional and modern statistical approaches and how they can be appropriately applied in "big data" settings; and (3) accurately interpret and clearly present findings from the application of statistical and econometrics procedures to datasets -- including large datasets -- and use analytical results for the sake of forecasting, prediction, risk management, or strategic decision-making in a business, institutional, or research environment. With this training, students completing the Master of Data Analytics program will be qualified to meet the modern demands of business and high technology, particularly within the dynamic job market across the Wasatch Front.

Reflecting the multi-disciplinary nature of data analytics, this program will consist of a core combination of 17 credits from across Mathematics and Statistics, Management Information Systems (MIS), and Economics and Finance (ECF). Students will choose an emphasis from Statistics, MIS, or ECF that will fill the balance of their course credits and determine their advising home or academic department. The capstone will be an applied project in collaboration with faculty and other students, involving real-world data-driven questions provided by corporate partners. This will provide a crucial conduit for qualified students to enter the workforce upon graduation by matching them with potential employers during their capstone experience.

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 mission of Utah State University is to be one of the nation's premier student-centered land grant and space grant universities by fostering the principle that academics come first; by cultivating diversity of thought and culture; and by serving the public through learning, discovery, and engagement. This degree program will fulfill these objectives in several significant ways. It will foremost support USU's academic mission by providing new opportunities for students to significantly improve their competitiveness and earning potential following graduation. It will serve the mission of research and discovery by providing a formal framework to train students under the "big data" initiative at USU, supported with new faculty lines introduced this year across several departments. This degree program will serve as an important academic and research nexus for many of these departments and their faculty (both existing and new) with interests in big data and analytics. The oversight of this degree

program -- including the proposed Data Solutions Committee (see Section V) -- will ensure that course content is complementary, so that faculty and departmental resources are used efficiently. Moreover, students will have access to structured cross-disciplinary training that will allow them to contribute more effectively to ongoing research projects that involve big data -- students demonstrating high potential may be recruited into laboratories or graduate programs across campus that have critical analytic needs. This program will also directly support USU's land-grant mission to engage the community. As summarized in Section III, the rapid growth of the high-tech and information industries in Utah -- particularly across the Wasatch front -- is creating an increasingly urgent need for data scientists. Ultimate objective with this program is to create capstone opportunities that will link students to business partners prior to graduation, thus creating a useful pipeline for Utah companies to fill their analytics positions.

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 proposed professional Master's program in Data Analytics (MDATA) has arisen from two years of deliberation and collaboration between the Departments of Mathematics and Statistics, Management and Information Systems, Economics and Finance, and Computer Science, including consultation with administrators from the College of Science, the Huntsman School of Business, and the College of Engineering. This is one of two complementary programs that have been jointly developed to best leverage the missions and faculty resources within the participating departments and colleges. In addition to this professional MDA degree, the Department of Computer Science is developing a Master's of Science in Data Science. The complementary nature of these two programs is discussed further below.

The critical need for data scientists and analysts has been consistently studied and documented in recent years both by professional organizations and within the mass media. Some of this labor market analysis is summarized under "Labor Market Demand", but the crucial consensus is the need for broader expertise that spans two or more of the areas of study represented by the collaborating departments. A recent Wall Street Journal article (see New Report Puts Numbers on Data Scientist Trend) points out that the high marketability of data scientists among U.S. companies reflects the short supply of people whose training is both technical and business-oriented. They further cite an analysis of the emerging data science and analytics disciplines by the software startup RJ Metrics, which found that the top five skill sets in terms of hiring potential include data analysis, data mining, machine learning, and knowledge of the programming languages R and Python.

USU is uniquely suited to offer a professional program that provides this kind of broad expertise. Over several years, the departments represented by this partnership have prioritized, both through hiring and through programmatic decisions, the kinds of emphases that significantly complement current demands for data and business analytics. For example, the Department of Mathematics and Statistics for many years has focused on hiring faculty in Statistics with interests in computation, high-dimensional data analysis, classification and prediction models, informatics, visualization, and the analysis of large data sets (e.g., using genetics and genomics data). USU's Management Information Systems Department has built a strong emphasis in the managing, cleaning, and processing of data. These combined areas of expertise provide a crucial foundation for programs in data science and analytics. Given current job market pressures, many academic institutions are scrambling to build such competencies from scratch. Their prior establishment and existence at USU provides an existing foundation, and -- coupled with the additional data science searches currently underway -- a ready opportunity to impact the state and regional economies both quickly and profoundly. This degree program will provide a key means of organizing efforts across departments, to leverage existing expertise in a structured way that will bring greater distinction to USU and to higher education in Utah.

"Big data", "data science", and "analytics" are denominations that are often used interchangeably within both the academic and professional communities -- they are still often applied loosely and are not precisely defined. This in part reflects the broad challenges and expertise engendered in an increasingly data-rich world. These challenges and opportunities not only involve training of analysts and data scientists to meet market demand, but also require fundamental research into the processes, infrastructure, and tools needed to address larger and more complex volumes of data. This proposal has thus been developed in consultation with the Department of Computer Science, as a complement to their proposed M.S. in Data Science that will provide some focus on novel solutions for computational research problems arising in big data and data science.

Labor Market Demand

Provide local, state, and/or national labor market data that speak to the need for this program. Occupational demand, wage, and number of annual openings information may be found at sources such as Utah DWS Occupation Information Data Viewer (jobs.utah.gov/jsp/wi/utalmis/gotoOccinfo.do) and the Occupation Outlook Handbook (www.bls.gov/oco).

Analytics and Data Science are relatively new job classifications, although jobs individually classified under Computer Science, Information Science, and Statistics are all in high demand. Information from the US Bureau of Labor Statistics (BLS) indicates total job growth of 11% for computer and information scientists through 2024. Utah Workforce Services projects much faster growth within the state, with an annual growth rate of 5.3% and total growth of 51% through 2024. The outlook for statisticians is similar, with 34% total projected growth by 2024 across the U.S., and a much higher annual growth rate of 4.2% (39% total growth) just within Utah. Given current demand and ongoing growth, salaries across these disciplines are correspondingly high. The latest salary survey from the American Statistical Association indicates a median starting salary of about $56K for statisticians with a Bachelor's degree, and a median of about $75K for those with at least a Master's.

While Data Science and Analytics are not yet used officially as job titles by the BLS, as indicated previously under "Rationale" there is already strong evidence that a combination of skills across Math/Stat, MIS, Economics, and CS yields greater opportunities than any one of their respectively more individualized degrees. In a study focused on data science, the *McKinsey Global Institut*e estimated that by 2018 the U.S. could face a shortage of 140,000 to 190,000 people with analytical expertise and as many as 1.5 million managers and analysts with the skills to understand and make decisions based on the analysis of big data -- a demand that will be 60% greater than the supply. Starting salaries already reflect this growing scarcity. The New York Times has covered the data science boom extensively for several years, with a recent article citing salaries that routinely start at the six-figure level (As Tech Booms, Workers Turn to Coding for Career Change). Both Bloomberg Businessweek (see Help Wanted: Black Belts in Data) and the Wall Street Journal (see article cited in the previous section) have more recently reported starting salaries for well-qualified data scientists in excess of $200K. Bloomberg additionally cites summer internships for students that are currently paying $6000-$10000 per month.

Student Demand

Provide evidence of student interest and demand that supports potential program enrollment. Use Appendix D to project five years' enrollments and graduates. Note: If the proposed program is an expansion of an existing program, present several years enrollment trends by headcount and/or by student credit hours that justify expansion.

Recent surveys of undergraduates across the Departments of Mathematics and Statistics, Management Information Systems, and Economics and Finance have strong interest in an MDATA program, with over 40% indicating that they are "Very Interested", and about 73% indicated that they are "Somewhat" or "Very Interested" in the program as described here. There were no significant differences in strength of interest across the three departments.

Moreover, in talking to administrators for other state and regional programs, there is consistently strong interest expressed through the volume of applications. The Marshall School of Business at the University of Southern California has recently built a program that is managed by three PhD graduates in Statistics from USU, and is similar in emphasis to what is intended to build at USU. According to their director, Dr. Abbass Al-Sharif (USU PhD 2012), they are currently averaging 900 applications for 30 positions. Similar feedback has been received from other universities in the Intermountain Region.

Similar Programs

Are similar programs offered elsewhere in the USHE, the state, or Intermountain Region? If yes, identify the existing program(s) and cite justifications for why the Regents should approve another program of this type. How does the proposed program differ from or compliment similar program(s)?

There are several Data Science and/or Analytics programs at the Master's level in the region. The University of Utah has a Master of Science in Computing, Data Management, and Analysis, as well as a Master of Science in Business Analytics through the Eccles School of Business. Colorado State University has a Master of Applied Statistics professional program, and the University of Colorado at Denver has a Master of Science in Business Analytics program. Colleagues at the University of Utah have indicated support of USU's efforts to also develop such programs, and agree that a strong job market has significant capacity -- even within just the state of Utah -- to absorb many more qualified graduates than the combined programs can produce. USU moreover already has significant expertise in these areas with a large and active statistics group, some of whose

members have been working in machine learning and data mining for over 15 years, and a Management Information Systems department with a strong emphasis in the managing, cleaning, and processing of data. The regional campuses within the USU community provide an additional unique opportunity to provide training in Analytics to students across the state as broadcast and online options are developed as a part of this program.

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 designated service areas for Utah State University include Cache, Rich, Box Elder, Duchesne, Uintah, Daggett, Tooele, Emery, Carbon, Grand, and San Juan counties and USU maintains regional campuses and education centers in all of these counties. The proposed delivery area for the Master's in Data Analytics program is only within USU's service areas. Initially, most advanced coursework will be taught face-to-face at USU's Logan campus with IVC broadcast within USU's service area as demand justifies.

As indicated above, these plans have been discussed with the University of Utah -- currently the only other USHE institution with Master's programs in Data Science and Analytics. In discussions with Professor Peter Trapa, Chair of the U's Department of Mathematics, and Dr. Bradden Blair, the Director of the Master in Business Analytics program in the Eccles School of Business, they concur that the strong job market and volume of students pursuing such programs will ensure no negative impact on overall enrollments, and that there will be no duplicated effort.

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.

There are no accreditation requirements for this program, although the curriculum will be calibrated to prepare students individually for professional aCAP and CAP certification, as described in Section VI.

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.

The total number of credits required for the program is 33, consistent with Research and Graduate Studies requirements for professional degree programs. Students will be required to complete all course work with a grade of C- or higher.

Admission Requirements

List admission requirements specific to the proposed program.

Admissions requirements for the MDATA program will follow those of the USU School of Graduate Studies, as well other general guidelines or requirements of the Huntsman School of Business and the Department of Mathematics and Statistics.

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 proposed Master of Data Analytics program will not, by itself, require any new administrative structures or personnel. The collaborating departments for this project are planning to establish a Data Analytics Steering Committee with representatives from across the participating departments, in order to coordinate course curricula, student recruitment and admissions, and student capstone opportunities. The delivery of current undergraduate courses or programs will not be affected.

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.

Utah State University is extremely well prepared to build and deliver interdisciplinary programs in Data Analytics at the undergraduate and masters level. Faculty in the Department of Mathematics and Statistics have been at the forefront of teaching courses in visualization, machine learning, and computational analytics -- all key elements of Data Analytics. Faculty in the Department have been involved in the development and implementation in free and commercial computer packages of some key software in the Data Science world, including Random Forests and Archetypal Analysis. The Department of Management Information Systems has emphasized and recruited expertise in data base management and implementation, including data cleaning and validation, which are also key elements of Data Science. The Department of Computer Science offers a wide array of relevant programming coursework, including Python, the most widely used program in Data Science and Analytics. The Department of Computer Science already has expertise in Data Science and is building the research Master's degree in Data Science described earlier. Mathematics and Statistics and MIS are hiring this academic year, into positions funded centrally at USU and into open positions. Overall, USU already has a great deal of relevant expertise in Analytics and will be able to move ahead quickly when the program is approved.

Data Science and Analytics is a rapidly changing field and it is very important that faculty have the opportunity to attend conferences and workshops on the latest topics in the area. It is also important for faculty to have the time to create new courses in Data Science and Analytics and update/redevelop existing courses. Funds for these activities through years 1-3 will be provided internally through the partnering departments and colleges.

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.

No additional clerical or administrative staff will be required for the proposed program. The program itself is faculty-intensive, without any initial critical need for staff or capital investment. Utah State University already has extensive computer laboratories and classrooms, particularly in the new Huntsman Hall, and many computer programs are available free for students to download onto their home computers and laptops.

Student Advisement

Describe how students in the proposed program will be advised.

In each department, a faculty member who is engaged in the program will be assigned to be the program advisor and given appropriate release time from other duties.

Library and Information Resources

Describe library resources required to offer the proposed program if any. List new library resources to be acquired.

No additional library resources will be required to support the proposed Master of Data Analytics program. Utah State University already has extensive holdings of journals in the core areas of statistics, computer science, and management information systems. Further, students and faculty have access to a comprehensive collection of journals, books, and articles through the inter library systems.

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.

The proposed master's degree program (MDATA) is primarily a terminal professional degree program in analytics. It's purpose is to provide the foundation for a career in data science and analytics for qualified candidates. The professional field of data science and analytics is in a state of rapid development, and as a result professional standards are still actively emerging. However, the nascent professional standards provided by the Associate Certified Analytics Professional (aCAP) and Certified Analytics Professional (CAP) programs sponsored by the Institute for Operations Research and the Management Sciences (INFORMS) stand as independent certification standards for professional data scientists and employers. INFORMS is the largest society of professionals in the fields of operations research (OR), management science (MS) and analytics. The key difference between the aCAP and CAP certifications is the background experience of the candidate. The CAP program requires of its candidates a deep background in data science and analytics, while the aCAP program is aimed at candidates who are beginning their careers in analytics.

To quote from the Associate Certified Analytics Professional Handbook: “INFORMS analytics certifications programs advance the use of analytics by setting agreed upon standards for the profession and advance the profession by providing a means for organizations to identify and develop qualified analytics professionals, by contributing to the career success and continued competence for analytics professionals, and by improving the credibility and visibility of the analytics profession.” It further states that: “the focus is on those who are graduates of the many analytics master's programs that have been recently created.” The curriculum of the proposed MSA program is designed to help students successfully become candidates of the aCAP program. An important metric in measuring the success of the program will be the proportion of enrolled students taking the aCAP exam and the subsequent pass rate.

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.

The field of Data Analytics is inherently interdisciplinary. As such, students will be expected to gain competency in the core areas of statistical inference, computational modeling, and domain expertise in applied fields. As appropriate, formative and summative assessment measures for each core competency may include: master exams, class performance, evaluations and assignments, practicum evaluations, focus groups, presentations, fieldwork, and surveys. As stated above, over time an important metric will be the number of graduating students who successfully sit for the CAP and aCAP exams with success. A very important part of the programs will be the capstone project. A minimum of 3 credit hours of work on the project is required. A written proposal will be submitted to the student's Supervisory Committee before the student begins work on the project. At the end of the project, the student will present an oral or poster presentation of the project and will write a paper describing the work. The project will serve as a crucial metric of student success and performance.

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	
	Required Courses			
+ -	CS 3430		Computational Science: Python and Perl Programming	3
+ -	STAT 5050	X	Introduction to R	1
+ -	STAT 5650		Statistical Learning and Data Mining II	2
+ -	STAT 5560		Statistical Visualization I	2
+ -	ECN 5330		Applied Econometrics	3
+ -	MIS 6230		Database Management	3
+ -	STAT/MIS/ECN 6xxx		Capstone Project and Internship in Data Analytics	3
			Choose of the following courses:	
+ -				
+ -				
			Required Course Credit Hour Sub-Total	17
	Elective Courses			
+ -				
			Choose of the following courses:	
+ -				
+ -				
			Choose of the following courses:	
+ -				
+ -				
			Choose of the following courses:	
+ -				
+ -				
			Choose of the following courses:	
+ -				
+ -				
			Elective Credit Hour Sub-Total	0
			Core Curriculum Credit Hour Sub-Total	17

Can students complete this degree without emphases? Yes or X No

	Course Number	NEW Course	Course Title	Credit Hours
	Name of Emphasis:		Statistics	
+ -	STAT 5080	X	Data Technologies	2
+ -	STAT 5150	X	SAS Predictive Analytics	2
+ -	STAT 5680	X	Statistical Thinking for Big Data	3
+ -	STAT 6560		Statistical Visualization II	2
+ -	STAT 6650		Statistical Learning and Data Mining II	2
			Choose 2 of the following courses:	
+ -	STAT 5120		Categorical Data Analysis	3
+ -	STAT 5410/6410		Applied Spatial Statistics	3
+ -	STAT 5500/6500		Biostatistical Methods	3
+ -	STAT 5570/6570		Statistical Bioinformatics	3
+ -	STAT 6100		Advanced Regression Analysis	2
+ -	CS 5665		Introduction to Data Science	3
+ -	CS 5810		Applied Data Science Incubator	3
+ -	CS 6665		Data Mining	3
+ -	CS 6675		Advanced Data Science and Data Mining	3
+ -				
			Emphasis Credit Hour Sub-Total	16
			Total Number of Credits to Complete Program	33
	Remove this emphasis			

	Course Number	NEW Course	Course Title	Credit Hours
	Name of Emphasis:		Management Information Systems	
+ -	MIS 5150		Emerging Technologies: Data Cleansing	3
+ -	MIS 5150		Emerging Technologies: Tableau Business	3
+ -	MIS 6500	X	Advanced Business Intelligence and Data Mining	3
+ -				
			Choose 3 of the following courses:	
+ -	STAT 5080	X	Data Technologies	2
+ -	STAT 5150	X	SAS Predictive Analytics	2
+ -	MIS 6330		Database Implementation	3
+ -	CS 5665		Introduction to Data Science	3
+ -				
+ -				
			Emphasis Credit Hour Sub-Total	16
			Total Number of Credits to Complete Program	33
	Remove this emphasis			

	Course Number	NEW Course	Course Title	Credit Hours
	Name of Emphasis:		Economics	
+ -	ECN 5330		Financial Econometrics	3
+ -	FIN 6320		Computational Methods	3
+ -				
			Choose 4 of the following courses:	
+ -	FIN 5100		Financial Markets and Trading	3
+ -	FIN 5300*		Fixed Income*	3
+ -	FIN 6460*		Investment Analysis*	3
+ -	FIN 6470*		Derivatives Markets*	3
+ -	ECN 7310		Econometrics I	3
+ -	ECN 7320		Econometrics II	3
+ -	STAT 5080		Data Technologies	2
+ -	STAT 5150		SAS Predictive Analytics	2
+ -				
+ -			*Must select one of these	
+ -				
			Emphasis Credit Hour Sub-Total	16
			Total Number of Credits to Complete Program	33
	Remove this emphasis			

Program Curriculum Narrative

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

The total course requirement consists of 17 credits in the program core and a further 16 (or more) credits from required and elective courses within a chosen emphasis. Students entering the program should have a modest analytical background at the level of STAT 5100 (Linear Regression and Time Series), along with some training in programming that preferably includes algorithms and data structures. The program core involves preparation in database management and implementation, econometrics, R programming as a foundation for many other analytics courses, and introductory statistical visualization, data mining, and machine learning. Students also choose an emphasis in Statistics, Economics and Finance, or Information Systems, as outlined in the table above. Program advisors will work with each student to develop a program of study that is most appropriate for the student's background, determining an emphasis based on the student's aims and goals in entering the Master of Data Analytics program. In special cases, elective coursework outside of that listed above (e.g., in Computer Science) may be approved by the student's committee. In particular, an elective course from another track may be substituted within a given track. Students that are particularly well prepared and have already completed elements of the core may substitute other elective course for the core course that they already have.

A very important part of the MDATA program is the capstone project. A minimum of 3 credit hours of work on the project is required. A written proposal will be submitted to the student's Supervisory Committee before the student begins work on the project. At the end of the project, the student will present an oral or poster presentation of the project and will write a paper describing the work.

Degree Map

Degree maps pertain to undergraduate programs ONLY. Provide a degree map for proposed program. Degree Maps were approved by the State Board of Regents on July 17, 2014 as a degree completion measure. Degree maps or graduation plans are a suggested semester-by-semester class schedule that includes prefix, number, title, and semester hours. For more details see http://higheredutah.org/pdf/agendas/201407/TAB%20A%202014-7-18.pdf (Item #3).

Please cut-and-paste the degree map or manually enter the degree map in the table below.

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			
Faculty: Part Time with Doctorate			
Faculty: Full Time with Masters			
Faculty: Part Time with Masters			
Faculty: Full Time with Baccalaureate			
Faculty: Part Time with Baccalaureate			
Teaching / Graduate Assistants			
Staff: Full Time			
Staff: Part Time			

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							
	Adele	Cutler	T	PhD	University of California, Berkeley	50	Math & Stat
	David Richard	Cutler	T	PhD	University of California, Berkeley	50	Math & Stat
	Juergen	Symanzik	T	PhD	Iowa State University	50	Math & Stat
	Christopher	Corcoran	T	PhD	Harvard University	25	Math & Stat
	Daniel	Coster	T	PhD	University of California, Berkeley	25	Math & Stat
	John	Stevens	T	PhD	Purdue University	50	Math & Stat
	Guifang	Fu	TT	PhD	Pennsylvania State University	25	Math & Stat
	Yan	Sun	TT	PhD	University of Cincinnati	25	Math & Stat
	Kady	Schneiter	T	PhD	Utah State University	25	Math & Stat
	David	Olsen	T	PhD	University of Arizona	10	MIS
	Zsolt	Ugray	T	PhD	University of Texas at Austin	30%	MIS
	Robert	Mills	T	PhD	Utah State University	30%	MIS
	Kathy	Chudoba	T	PhD	University of Arizona	30%	MIS
	John	Johnson	T	PhD	Texas A & M University	30%	MIS
	Brian	Dunn	TT	PhD	University of Pittsburg	30%	MIS
	Tyler	Brough	T	PhD	University of Arizona	50%	Econ & Fin
	Ben	Blau	T	PhD	University of Mississippi	25%	Econ & Fin
	Ryan	Whitby	T	PhD	University of Utah	25%	Econ & Fin

	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
	Danjue	Shang	TT	PhD	University of Arizona	25%	Econ & Fin
	Paul	Fjelsted	T	MBA	Harvard University	10%	Econ & Fin
	TJ	Bond	Other	PhD	Harvard University	10%	Econ & Fin
	Briggs	Depew	TT	PhD	University of Arizona	25%	Econ & Fin
	Devon	Gorry	TT	PhD	University of Chicago	10%	Econ & Fin
	Frank	Caliendo	T	PhD	Utah State University	25%	Econ & Fin
	John	Gilbert	T	PhD	University of Auckland	10%	Econ & Fin
	Quyen	Nguyen	TT	PhD	University of Arizona	10%	Econ & Fin
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		2		Background and experience related to Statistics and MIS	50%
Faculty: Part Time with Doctorate					
Faculty: Full Time with Masters					
Faculty: Part Time with Masters					
Faculty: Full Time with Baccalaureate					
Faculty: Part Time with Baccalaureate					
Teaching / Graduate Assistants					
Staff: Full Time					
Staff: Part Time					

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	150					
# of Majors in Proposed Program(s)		10	20	40	50	50
# of Graduates from Department	30					
# Graduates in New Program(s)				10	20	40
Department Financial Data						
	Department Budget					
	Year Preceding Implementation (Base Budget)	Year 1 Addition to Base Budget for New Program(s)	Year 2 Addition to Base Budget for New Program(s)	Year 3 Addition to Base Budget for New Program(s)		
Project additional expenses associated with offering new program(s). Account for New Faculty as stated in Appendix C, "Faculty Projections."						
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)		$190,000	$190,000	$190,000		
Operating Expenses (equipment, travel, resources)		$60,000	$60,000	$60,000		
Other:						
TOTAL PROGRAM EXPENSES		$250,000	$250,000	$250,000		
TOTAL EXPENSES	$0	$250,000	$250,000	$250,000		
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		$250,000	$250,000	$250,000		
Appropriation						
Special Legislative Appropriation						
Grants and Contracts						
Special Fees						
Tuition						
Differential Tuition (requires Regents approval)						
PROPOSED PROGRAM FUNDING		$250,000	$250,000	$250,000		
TOTAL DEPARTMENT FUNDING	$0	$250,000	$250,000	$250,000		
Difference						
Funding - Expense	$0	$0	$0	$0		

Part II: Expense explanation

Expense Narrative

Describe expenses associated with the proposed program.

New Ongoing Faculty/Staff Expenses
Mathematics and Statistics Faculty Member (tenure-track, salary and benefits): $85,000 (beginning year 1)
Management Information Systems Faculty Member (KHS, tenure-track, salary and benefits): $105,000 (beginning year 1)

New Ongoing Recruitment and Training Costs
Travel for Faculty Development and Training (Related to Instruction): $10,000 (beginning year 1)
Recruitment and Marketing: $20,000 (beginning year 1)

One Time Course Development Costs in Yrs 1-3
Distance Delivery Course Conversion $30,000 ($1,000/credit for 30 credits split between yrs 1-3)

Part III: Describe funding sources

Revenue Narrative 1

Describe what internal reallocations, if applicable, are available and any impact to existing programs or services.

Ongoing funding for new faculty positions has already been provided by the Provost's Office, and corresponding searches are currently underway. Support for recruitment, marketing, and faculty training and development will be provided using one-time support in years 1-3 from the HSB and College of Science. Anticipate that revenue from online and other delivery modes (e.g., modules for professional development) will support these activities following the third year. Academic Instructional Services (AIS) will provide financial support for course conversion to online delivery formats based on specific needs of each course.

Revenue Narrative 2

Describe new funding sources and plans to acquire the funds.

No new funding sources are required, in addition to new faculty positions and reallocations described above. As a professional degree program, there is no anticipated requirement or request for tuition waivers or teaching assistantships.