

July 6, 2016

MEMORANDUM

TO: State Board of Regents

FROM: David L. Buhler

SUBJECT: University of Utah – Master of Science in Business Analytics

Issue

The University of Utah (UU) requests approval to offer a Master of Science in Business Analytics effective Fall Semester, 2016. This proposal was approved by the institutional Board of Trustees April 12, 2016.

Background

Organizations in the private and public sectors need employees who know how to gather, store and analyze data to make informed decisions. Demand for analytics professionals with both business and data science knowledge has been growing rapidly in Utah and across the nation. There is a need to provide opportunities for students to develop the skills needed to frame relevant business problems, translate those problems into an analytics framework, determine the necessary data, create relevant models, use the models to compare alternative solutions, and ultimately make and communicate fact-based decisions.

A growing demand for graduates with analytics talent has led to several new programs at other reputable schools in the United States. This proposal is a strategic move to stay competitive with the other programs in the nation and to meet market and student needs.

A 2011 report by McKinsey & Company highlighted the significance of big data as a pillar of competitive advantage. The report noted that organizations are expected to face significant challenges in recruiting individuals with the necessary skills to take advantage of big data. It estimated that by 2018 the United States could face a shortage of 140,000 to 190,000 people with deep analytical skills as well as a shortage of 1.5 million managers and analysts with the skills to use analytics to make effective decisions.

Through this proposed program, the UU seeks to prepare individuals and organizations to be better equipped to handle the growing need of analysis through use of large data systems. The Master of Science in Business Analytics (MSBA) is designed to provide students with the technical competence and business foundation necessary to work with big data in business settings. The MSBA is intended to attract full-time students and working professionals who want to deepen their understanding of the application of data analytics to business problems.

The program is designed to be completed within a minimum of 33 credit hours. All courses, and especially the capstone course, include instruction in and experience with defining business and analytic problems, collecting and organizing data, creating models to analyze the defined problem, and presenting results to communicate to business executives. Upon completion of the courses and capstone experience, students will be prepared to become certified through INFORMS as either a Certified Analytics Professional, or a Certified Analytics Professional Associate, depending on the previous work experience of the student. INFORMS is an acronym for the Institute for Operations Research and the Management Sciences, a professional organization that supports the fields of operations research, management sciences, and analytics.

A related 18 credit hour Graduate Certificate in Business Analytics has been developed by the institution and will be a companion program to the MSBA program. Consistent with policy, the Graduate Certificate program is included on the General Consent Calendar.

As preparation for this proposal was made, the institution held a focus group composed of representatives from eight large companies that rely on data as a key ingredient to support their products and services. The institution reported that focus group members voiced strong support for a business analytics program, helped define the curricular structure, and indicated a desire to hire program graduates.

From 2012 – 2022 the Utah State Department of Workforce Services projects that Database Administrators (SOC code 15-1141), an occupational group related to the program, will see a 3% average annual growth rate, an average of 40 annual job openings in the state, and annual median pay of \$81,150.

The program will require addition of three new graduate-level courses and two additional full-time faculty members. Program costs will be covered through tuition revenues.

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 Master of Science in Business Analytics.

David L. Buhler
Commissioner of Higher Education

DLB/BKC
Attachment

**Program Description – Full Template
University of Utah
Master of Science in Business Analytics**

Section I: The Request

The University of Utah requests approval to offer the Master of Science in Business Analytics effective Fall Semester, 2016. This program was approved by the institutional Board of Trustees on April 12, 2016.

Section II: Program Description

Complete Program Description

To thrive in today's competitive marketplace, almost all organizations need to capture, organize, analyze, synthesize and utilize data to make informed decisions. Knowledge and tools from disciplines like computer and information sciences, statistics, mathematics and the functions of business are needed to make sense of high volumes of data. The Master of Science in Business Analytics (MSBA) is designed to provide students with the technical competence and business orientation necessary to compete successfully in the world of "big data." The MSBA is intended to attract full-time students and working professionals who want to deepen their understanding of the application of data analytics to business problems.

The MSBA is comprised of 10 core courses (27-credit hours), 1-2 elective courses (3-credit hours) and 1 capstone course (3-credit hours) for a total of 33 semester hours (minimum). The curriculum is built around an industry certification for analytics professionals and includes classes in data storage and management, data analysis using statistical and machine-learning methods, data visualization and applications to marketing, finance, operations management, accounting, strategy and management. All courses, and especially the capstone course, include instruction in and experience with defining business and analytic problems, collecting and organizing data, creating models to analyze the defined problem, and presenting results to communicate to business executives. Upon completion of the courses and capstone experience, students will be prepared to become certified through the Institute for Operations Research and the Management Sciences (INFORMS) as either a Certified Analytics Professional (CAP), or a Certified Analytics Professional Associate (CAPA), depending on the previous work experience of the student.

Purpose of Degree

The MSBA is designed to meet the growing needs of industry for analytics professionals. While there is a national trend of businesses requiring people skilled in analytics, to document local need the institution assembled a focus group of representatives from local healthcare, finance, marketing, manufacturing, software and other organizations. Feedback from this group demonstrated that local industry desires qualified analytics professionals and that a master's degree in business analytics would be a significant way to meet labor market demand.

Institutional Readiness

The David Eccles School of Business (DESB) already offers several stand-a-lone master degrees and has created an infrastructure to manage such programs. That infrastructure includes some centralized functions (e.g., a centralized Business Career Services and a graduate admissions group) and some program-specific administration consisting of program directors and managers. The School has an

associate dean who oversees graduate programs. Program directors meet together regularly to identify, discuss and address issues that are common to all programs.

The addition of the MSBA degree will require the appointment of a program director, a part-time career counselor, and at least one supporting staff member to have the same capabilities as the existing programs. In the first couple of years it is possible that an existing director (e.g., the director of the Master of Science of Information Systems (MSIS) program) and associated staff – minus the career personnel – will be able to manage the MSBA program. The anticipated growth, however, will require that a separate director and staff be selected.

In terms of faculty, the School is positioned to offer program courses. There are scholars and teachers in several departments (including those specializing in marketing, information systems, strategy and statistics) who already offer courses with heavy analytics components and hence are prepared to offer the classes proposed for the new program. Some faculty members teach undergraduate classes, so there will necessarily be an impact on the staffing of lower-division courses. In the longer term, however, it is anticipated that the expertise and experience gained through the new master program will lead to the establishment of new classes and even a degree program at the undergraduate level that emphasizes analytics. In order to grow, additional faculty will be hired to staff classes within the program or to staff classes that are left unstaffed because of a shift of faculty to courses in the new program.

Departmental Faculty

Department Faculty Category	Dpt Faculty Headcount – Prior to Program Implementation	Faculty Additions to Support Program	Dpt Faculty Headcount at Full Program Implementation
With Doctoral Degrees (Including MFA and other terminal degrees, as specified by the institution)			
Full-time Tenured	16	2	18
Full-time Non-Tenured	4		4
Part-time Tenured			
Part-time Non-Tenured			
With Master’s Degrees			
Full-time Tenured			
Full-time Non-Tenured	3		3
Part-time Tenured			
Part-time Non-Tenured	18		18
With Bachelor’s Degrees			
Full-time Tenured			
Full-time Non-Tenured			
Part-time Tenured			
Part-time Non-Tenured			
Other			
Full-time Tenured			
Full-time Non-Tenured			
Part-time Tenured			
Part-time Non-Tenured			

Total Headcount Faculty in the Department			
Full-time Tenured	16	2	18
Full-time Non-Tenured	7		7
Part-time Tenured			
Part-time Non-Tenured	18		18
Total Department Faculty FTE <i>(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.")</i>	26	2	28

Staff

To be similar to staff in other specialized master degrees, the institution anticipates the need for one program director, one program manager (who will also act as an advisor and help supervise capstone projects), and a half-time career counselor. There will also be some need for teaching assistants who are working on doctoral degrees.

Library and Information Resources

The current resources available through the Marriott Library are anticipated to be sufficient for the implementation of the new program.

Admission Requirements

The admission requirements for the MSBA degree will be almost identical to those of other programs within DESB. Because of the quantitative nature of the program, more weight will be given to the quantitative section(s) of standardized tests and to quantitative undergraduate courses. The evidence currently used by other programs when making admissions decisions, and anticipated to be used for the MSBA degree, are delineated below.

- School of Business Online Application
- GRE/GMAT Test Score

An official GRE or GMAT test score is required for all MSBA applications. There are no minimum GRE or GMAT scores required for application. Applicants are encouraged to meet overall program GRE/GMAT 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, or a 3.0 GPA from the last 60 credit hours taken in cases where overall GPA values fall below 3.0.

- Two Letters of Recommendation

- One statement-of-purpose essay, describing the applicant’s intent and goals for the program (submitted within the online application).
- Resume
- English Language Proficiency.

International applicants must receive a minimum score of 90 on the TOEFL iBT exam or 6.5 on the IELTS exam.

Student Advisement

As with other MS programs in DESB, a dedicated advisor will be assigned to the MSBA program. The advisor will meet with students one-on-one and will have regular opportunities to interact with the students in larger groups. Career counselors will work with students to identify potential employment opportunities and to advise concerning resumes, interviewing skills, etc. Faculty will also provide mentoring to students and provide curriculum and career guidance to the extent possible.

Justification for Graduation Standards and Number of Credits

The program can be completed within 33 credit hours. The number of credits is the minimum required to have the necessary exposure to core topics in analytics and to gain more experience in one functional area such as marketing analytics and is consistent with Regent policy.

External Review and Accreditation

Like all of the programs in DESB, the MSBA will be subject to accreditation review by the Association to Advance Collegiate Schools of Business (AACSB). The School and its programs are evaluated approximately once every five years. The MSBA program has been designed with AACSB requirements and recommendations in mind.

Projected Program Enrollment and Graduates; Projected Departmental Faculty/Students

The student FTE numbers in the table below are based on enrollments in the Marketing and Operations and Information Systems undergraduate majors and master degrees. Each undergraduate student enrolled in a major was considered 1.0 FTE, while each student in the MSIS program was considered only .75 FTE. The total FTE assumes growth in existing programs as well as in the new program.

Data Category	Current – Prior to New Program Implementation	PROJ YR 1	PROJ YR 2	PROJ YR 3	PROJ YR 4	PROJ YR 5
Data for Proposed Program						
Number of Graduates in Proposed Program	X	5	10	20	30	40
Total # of Declared Majors in Proposed Program	X	10	20	30	40	50
Departmental Data – For All Programs Within the Department						
Total Department Faculty FTE (as	26	26	26	27	27	28

<i>reported in Faculty table above)</i>						
Total Department Student FTE (Based on Fall Third Week)	530	540	565	600	645	700
Student FTE per Faculty FTE (ratio of Total Department Faculty FTE and Total Department Student FTE above)	20.4	20.8	21.7	22.2	23.9	25.0
Program accreditation-required ratio of Student FTE/Faculty FTE, if applicable: (Provide ratio here: _____)						

Expansion of Existing Program

With the implementation of the MSBA program it is anticipated to draw some students from the Business Intelligence and Analytics emphasis of the Master of Science in Information Sciences (MSIS) program. However, the MSIS program has seen strong growth since its inception with 182 enrolled and 198 declared MSIS students as of September, 2015. It is anticipated that while some MSIS students may enroll in the MSBA program, overall there will be an increase in enrollments because the new program fills a current industry gap.

Section III: Need

The MSBA will be differentiated from the existing MSIS emphasis in that it will provide a more focused analytics experience and broader exposure to analytics applications in areas such as digital marketing and e-commerce. Students will thus be offered a choice between a pure Information Sciences focus, the blended MSIS emphasis on Business Intelligence and Analytics, and the pure MSBA analytics focus with preparation for the CAP certification.

Program Need

Enterprises in the private and public sectors need employees who know how to gather, store and analyze data to make informed decisions. As the Labor Market Demand section will elaborate, the demand for analytics professionals with both business and data science knowledge has been growing in the state of Utah and the rest of the nation. The courses in the new program integrate quantitative and business knowledge in real-world oriented contexts.

The growing demand for graduates with analytics know-how has led to several new programs at other reputable schools in the United States and (to a lesser degree) across the world. The proposal is a strategic move to stay competitive with the other institutions in the nation and to meet local and national market and student needs.

Labor Market Demand

In March of 2015, the U.S. Department of Commerce released an economic brief that addressed the growing importance of data in the economy. One of the key findings of the report was the observation that data related jobs not only pay higher wages, but also represent a significant driver of occupational growth. Occupations where working with data is either central to or an important part of the job currently account for

over half of the workforce and this percentage is expected to grow. Not surprisingly, business and financial operations account for more data related jobs than any other occupational category (approx. 34% of all jobs).¹

A 2011 report by McKinsey & Company highlighted the significance of big data as a pillar of competitive advantage. The report noted that organizations are expected to face significant challenges in recruiting individuals with the necessary skills to take advantage of big data. It estimated that “by 2018, the United States alone could face a shortage of 140,000 to 190,000 people with deep analytical skills as well as 1.5 million managers and analysts with the know-how to use the analysis of big data to make effective decisions”². Left unaddressed, this shortage could have significant negative implications for Utah’s future economic growth and development.

Besides evidence from national sources, there is evidence that local organizations are ready for a program in business analytics. On July 17, 2015, the institution held a focus group with representatives from a number of businesses that rely on data as a key strategy component to their operations. Focus group members voiced support for a business analytics program, helped define what such a program would look like and indicated that they very much would like to hire graduates from a business analytics program at the University of Utah.

Student Demand

In April 2015 the institution conducted a survey of undergraduate students within DESB to gauge interest in a degree in analytics. The results indicated that more than half of the nearly 400 respondents would either definitely pursue or strongly consider pursuing an advanced degree in business analytics. Of 58 students who indicated they would not likely pursue such a degree, only about 25% indicated that they were not interested in analytics; the majority had other reasons including no desire for an advanced degree or plans to do graduate work outside of Utah.

Similar Programs

While there are programs or certificates within the Utah System of Higher Education that have some overlap with parts of the proposed program, there is not a master’s degree in the state that is specifically dedicated to business analytics.

Collaboration with and Impact on Other USHE Institutions

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.

Benefits

While student and employers will be the principal beneficiaries of the proposed program, the program will raise the visibility of DESB and help with the current trend of improved rankings for the School providing increased awareness and prestige to the institution and the state.

¹ http://www.esa.doc.gov/sites/default/files/the-importance-of-data-occupations-in-the-us-economy_0.pdf

² http://www.mckinsey.com/insights/business_technology/big_data_the_next_frontier_for_innovation

Consistency with Institutional Mission

The MSBA program will also contribute to the mission of the University of Utah through *“the discovery, creation and application of knowledge; through the dissemination of knowledge by teaching, publication...and technology transfer; and through community engagement”* in the area of analytics and data science (italicized language from the University Mission Statement). The core curriculum and matriculation benchmarks are designed to facilitate discovery and knowledge creation not only at a broad level, but also specifically within the context of business. Through this program the David Eccels School of Business is working to build foundations for ethical business leadership by creating, discovering and communicating knowledge about leading edge research, innovation, and best management practices.

Section IV: Program and Student Assessment

Program Assessment

The following goals for student performance and success have been developed:

- Recruiting, admission and retention goals and measures
 - Goals – to recruit high-caliber applicants and retain students in quantities that meet or exceed the five-year program size projections.
 - Measures – applicant pool size and program size, # of applicants recruited per recruiting channel/event, average GRE or GMAT and GPA of applicants and of students (especially in quantitative areas), # of applicants, and students by most recent location and degree/institution.
- Student learning and graduation goals and measures
 - Goals – to graduate 95% of the students admitted who meet the learning goals of MSBA.
 - Measures – the learning measures include
 - The student demonstrates analytics and data science knowledge, technical skills and business understanding in the classes with 3.0 or higher GPA.
 - The student is effective in integrating business knowledge and analytics concepts in a real world project by achieving a B or higher grade from the capstone class.
 - The student is effective with analytical and critical thinking as measured using assignments or projects in program course work.
 - The student is effective with teamwork as measured using group projects in the program study.
 - The student is effective with written and oral communication measured using assignment, case analysis, and project writing and presentation in classes.
 - The student is able to complete satisfactorily the INFORMS CAPA or CAP certification requirements.
- Placements goals and measures
 - Goals – to help MSBA graduates obtain career opportunities that leverage the knowledge they have learned in the program.
 - Measures – # of positions by title, skills used, companies and industry as well as average salaries, sign-on bonus, and stock options received in students' offers.
- Student evaluation goals and measures
 - Goals – to assure positive student and graduate perceptions of program design, study benefits and quality of cohort for improvement of the MSBA Program.

- Measures – summaries of students’ mid study, exit, and alumni interviews/surveys
- External evaluation goals and measures
 - Goals – to assume positive perceptions of students and graduates by recruiters, guest speakers, project sponsors and coordinators for MSBA students for improvement of MSBA program.
 - Measures – summaries of external surveys
- Financial goals and measures
 - Goals – to meet or exceed the budget projection
 - Measures – Student credit hours, revenues from MSBA, and scholarships and program funds raised.

Expected Standards of Performance

MSBA students will be expected to meet the performance standards in the following competencies, which are based on the domains and associated tasks identified in the INFORMS CAP certification.

Domain I Business Problem (Question) Framing

- T-1 Obtain or receive problem statement and usability requirements
- T-2 Identify stakeholders
- T-3 Determine if the problem is amenable to an analytics solution
- T-4 Refine the problem statement and delineate
- T-5 Define an initial set of business benefits
- T-6 Obtain stakeholder agreement on the problem

Domain II Analytics Problem Framing

- T-1 Reformulate the problem statement as an analytics problem
- T-2 Develop a proposed set of drivers and relationships to outputs
- T-3 State the set of assumptions related to the problem
- T-4 Define key metrics of success
- T-5 Obtain stakeholder agreement

Domain III Data

- T-1 Identify and prioritize data needs and sources
- T-2 Acquire data
- T-3 Harmonize, rescale, clean and share data
- T-4 Identify relationships in the data
- T-5 Document and report findings (e.g., insights, results, business performance)
- T-6 Refine the business and analytics problem statements

Domain IV Methodology (Approach) Selection

- T-1 Identify available problem solving approaches (methods)
- T-2 Select software tools
- T-3 Test approaches (methods)
- T-4 Select approaches (methods)

Domain V Model Building

- T-1 Identify model structures*
- T-2 Run and evaluate the models
- T-3 Calibrate models and data*?
- T-4 Integrate the models*
- T-5 Document and communicate findings (including assumptions, limitations and constraints)

Domain VI Deployment

- T-1 Perform business validation of the model
- T-2 Deliver report with findings; or
- T-3 Create model, usability and system requirements for production
- T-4 Deliver production model/system*
- T-5 Support deployment

The main mechanism that will be used to evaluate whether or not students have mastered the 6 domains above will be the CAP certification itself. Due to anticipated limitations on experience, the majority of the graduates of the program will be expected to pursue CAPA, specifically designed for recently graduated students.

Section V: Finance

Department Budget

MSBA Students	Year 1	Year 2	Year 3	Year 4	Year 5
Incremental Headcount	10	20	30	40	50
Tuition per student	\$28,000	\$28,000	\$28,000	\$28,000	\$28,000
MSBA Revenue = Tuition	Year 1	Year 2	Year 3	Year 4	Year 5
Gross Tuition	\$280,000	\$560,000	\$840,000	\$1,120,000	\$1,400,000
Tuition to Eccles (80%)	\$224,000	\$448,000	\$672,000	\$896,000	\$1,120,000
TOTAL Expenses	Year 1	Year 2	Year 3	Year 4	Year 5
Staff Salaries, Wages, & Benefits	\$63,000	\$63,000	\$251,500	\$251,500	\$251,500
Faculty Salaries, Wages, & Benefits	\$200,000	\$500,000	\$555,000	\$855,000	\$1,055,000
Travel, Marketing, Other	\$21,000	\$5,000	\$45,500	\$29,500	\$53,500
TOTAL Expenses	\$284,000	\$568,000	\$852,000	\$1,136,000	\$1,360,000

MSBA Revenues - Expenses	(\$60,000)	(\$120,000)	(\$180,000)	(\$240,000)	(\$240,000)
Certificate Students	Year 1	Year 2	Year 3	Year 4	Year 5
Incremental Headcount	5	10	15	20	20
Tuition per student	\$15,000	\$15,000	\$15,000	\$15,000	\$15,000
Cert. Revenue = Tuition	Year 1	Year 2	Year 3	Year 4	Year 5
Gross Tuition	\$75,000	\$150,000	\$225,000	\$300,000	\$300,000
Tuition to Eccles (80%)	\$60,000	\$120,000	\$180,000	\$240,000	\$240,000
Total MSBA Degree + Cert Revenues - Expenses	\$0	\$0	\$0	\$0	\$0

Budget Summary

The above figure shows an estimate of incremental student headcount and revenue for both the proposed MSBA degree and the graduate certificate in business analytics. Resources and expenses for both programs will be shared. As shown, the student headcount from both the degree program and certificate lead to a total tuition which will fully fund the new programs. Based on this estimate, there should be no impact to existing budgets.

Funding Sources

Tuition will be the primary funding source to support the program. The portion of tuition that stays within DESB is roughly 80%. It is likely that donations from alumni and other supporters would flow to the program at some future point.

Expenses

Expenses are broken into three categories, based on previously approved program budgets. The relevant expenses are the following: staff, faculty, and travel.

Staff

As mentioned previously, the MSIS program is a similarly quantitatively-based graduate business program. As such, where possible, resources will be shared across these two programs. Four areas of staff support to consider are Program Management, Admissions, Academic Advising, and Career Services.

- Program Management: In the first two years, the program can be managed by existing Program Leadership (e.g. MSIS Program Director). After the program has been established, however, a new Program Director will be necessary in year three to manage and grow the MSBA program.

This position will teach, and as such, part of the salary is included in the Staff Wages and part in Faculty Wages.

- Admissions: Given a recent reorganization and the fact that new admissions staff have been hired in other areas, current MSIS admissions staff has bandwidth to support the admissions work for this new degree. No new staff needed.
- Academic Advising: A new FTE to the MSIS staff has been added, allowing some part of the academic advising to be completed with existing headcount. New program manager to be added in year three.
- Career Services: Currently, one person is supporting both graduate and undergraduate information systems students. There is no additional bandwidth there. The institution proposes adding 0.5 FTE of Career Services staff to support this new program. Given a roughly 200 graduate student/career counselor ratio, this FTE will be able to help build relationships in the early years and will develop the career services programming in addition to counseling students. They will also teach a portion of the capstone course for these students.

Faculty

Current faculty members have the expertise within the University to teach program courses. That being said, there will be need to hire adjunct or overload faculty to meet student demand for program courses. In addition, in years two and four, it is expected enrollment size to justify funding additional tenure-track hires.

Travel/Marketing/Other

A travel and marketing budget has been included for admissions, recruiting, development of website and marketing materials, etc. Given that this will be a new program, there are plans to invest heavily in year one to develop materials and build awareness. In years three and five when a new Program Director and Program Manager are hired, the increased budget accounts for additional trips and a broader outreach strategy.

Reallocation

No internal reallocation is requested at this point.

Impact on Existing Budgets

Because the program will be self-sufficient, the program does not impact the existing budgets of other units.

Section VI: Program Curriculum

All Program Courses (with New Courses in Bold)

The following highlights the requirements for completing the MSBA degree:

- 33 credit hours consisting of 10 core courses (27 credit hours), one to two elective courses (3 credit hours) and one capstone course (3 credit hours) for students who meet the MSBA degree prerequisites or equivalent at the time of admission. Students without prior coursework in statistics will be required to complete an additional three hour statistics course prior to the start of their first semester.
- 27 required core credit hours. Students with a substantial background in statistics or database theory and design may request approval to substitute elective classes for these core courses.
- A 3 hour capstone project in one of several tracks such as marketing, operations, and healthcare.

- Three elective credit hours. Illustrative elective courses are listed below. With permission from the MSBA curriculum committee, students can take courses in other schools (e.g., Computer Science) to expand their business, management, computing, statistics or other specialized knowledge. The IS, MKTG, and OIS electives listed below are open to all students in the MSBA program. Other electives may be open only to students with the appropriate prerequisites in prior coursework or professional background, at the discretion of the offering department.
- The list of courses is as follows.

Course Prefix and Number	Title	Credit Hours
<i>Required Courses</i>		
IS XXXX	Introduction to Business Analytics	1.5
OIS XXXX	Foundations of Data Science	3.0
IS 6420	Database Theory and Design	3.0
IS 6482	Data Mining	3.0
MKTG 6600	Marketing Analytics	3.0
IS 6481	Big Data Analytics	3.0
IS XXXX	Big Data Visualization	1.5
MKTG 6310	Marketing through Interactive Media	3.0
IS/MKTG XXXX	Supervised and Unsupervised Machine Learning	3.0
IS XXXX	Business Analytics Capstone Project	3.0
OIS 6610	Practical Management Science	3.0
Sub-Total		30
<i>Elective Courses</i>		
<i>Select 3 hours from the following</i>		
ACCT 6210	Strategic Cost Management	3.0
ACCT 6610	Financial Reporting	3.0
ACCT 6620	Business Analysis and Valuation	3.0
IS 6483	Advanced Data Mining	3.0
IS 6484	Advanced Data Management	3.0
IS 6480	Data Warehousing Design and Implementation	3.0
MKTG 6730	Strategic Marketing Communications	3.0
MKTG 6770	Consumer Insights and Analytics	3.0
FINAN 6390	Financial Modeling	3.0
FINAN 6400	Financial Engineering	3.0
OIS 6500	Visual Basic Applications for Business	1.5
OIS 6425	Lean Six Sigma	3.0
STRAT 6850	Business Analytics	3.0
Sub-Total		3
Track/Options (if applicable)		
Sub-Total		
Total Number of Credits		33

Program Schedule

The following figure shows the courses in the MSBA curriculum in an illustrative schedule. Courses for the MSBA consist of those already offered within DESB (green), courses which are currently offered but which will require some degree of modification for the MSBA program (blue), and courses which are not currently offered (orange). The new courses will benefit students in the MBA/PMBA program and other specialized master's programs in addition to students in the MSBA program. (The figure does not include the Practical Management Science simulation and optimization class, which students will take at some point of their program online.)

Fall Semester														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Introduction to Business Analytics (1.5)					Database Theory and Design (3.0)									
Foundations of Data Science (Statistics and Predictive Analytics using R) (3.0)										Data Mining (Part 1) (1.5)				
Business Analytics Capstone Project (Select: Marketing, Operations, Healthcare...)														
Spring Semester														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Data Mining (Part 2) (1.5)					Marketing Analytics(3.0)									
Big Data Analytics (using Hadoop, Apache) (3.0)										Big Data Visualization (1.5)				
Business Analytics Capstone Project (Select: Marketing, Operations, Healthcare...)														
Summer Semester														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Internet Analytics (3.0)										Elective (One 3.0 or Two 1.5)				
Supervised and Unsupervised Machine Learning using Python (3.0)														
Business Analytics Capstone Project (Select: Marketing, Operations, Healthcare...)														

Section VII: Faculty

NOTE: The number of faculty listed here does not completely match the numbers provided in tables above. There are two principal reasons: (1) the earlier tables included part-time faculty while the table

below does not; and (2) the template said to only count “departmental faculty” when creating the tables above. The table below includes two full-time faculty members who are outside of the Marketing and OIS departments and hence were not counted earlier.

<u>Tenure-track</u>	<u>Rank</u>	<u>Department</u>
Rohit Aggarwal	Associate Professor	Operations and IS
Krishnan Anand	Associate Professor	Operations and IS
Manu Goyal	Assistant Professor	Operations and IS
Paul Hu	Professor	Operations and IS
Jaelynn Oh	Assistant Professor	Operations and IS
Nabita Penmetsa	Assistant Professor	Operations and IS
Vandana Ramachandran	Assistant Professor	Operations and IS
Glen Schmidt	Professor	Operations and IS
Oliva Sheng	Professor	Operations and IS
Don Wardell	Professor	Operations and IS
Shyam Gopinath	Assistant Professor	Marketing
Arul Mishra	Professor	Marketing
Himanshu Mishra	Professor	Marketing
Bill Moore	Professor	Marketing
Jason Snyder	Assistant Professor	Entrepreneurship and Strategy
Miriah Meyer	Assistant Professor	School of Computing
<u>Career-line and Adjunct</u>		
Bradden Blair	Assistant Professor— Lecturer	Operations and IS
Mike Boyle	Assistant Professor— Lecturer	Operations and IS
Chris Dansie	Assistant Professor— Lecturer	Operations and IS
Tariq Mughal	Assistant Professor— Lecturer	Operations and IS
Chong Oh	Assistant Professor— Lecturer	Operations and IS
Weiyu Tsai	Associate Professor— Lecturer	Operations and IS
Antony Passey	Assistant Professor— Lecturer	Marketing