ATTACHMENT 3

NEW PROGRAM PROPOSAL
BASIC PROGRAM INFORMATION

Proposing institution:	Kansas State University
Title of proposed program:	Master of Science in Data Analytics
Degree(s) to be offered:	Master of Science
Anticipated date of implementation:	Fall 2018
Responsible department(s) or unit(s):	College of Business Administration
Classification of Instructional Program (CIP)	52.1804

New Degree Request - Kansas State University

Criteria	Program Summary
1. Program Identification	**Master of Science in Data Analytics (MS-DA)** CIP Code: 52.1804 Anticipated Effective Date: Fall 2018
2. Academic Unit	College of Business Administration; the Graduate Programs assume the responsibility for administering this program
3. Program Description	The MS-DA will be the program of choice for: • University students seeking a graduate education in data analytics; • K-State staff seeking to develop professional skills; • Young professionals seeking to improve their job prospects; • Companies seeking to hire top data analytics talents. The Master of Science – Data Analytics program is a graduate program, in collaboration with the Departments of Computer Science, Economics, Mathematics, Industrial Management and Systems Engineering, Statistics, and Geography, focusing on using advanced technologies to manipulate big data, utilizing rigorous methods to interpret the data, and obtaining the business skills necessary to translate understanding into actionable organizational strategies. Specifically, upon completion of the Master of Science – Data Analytics program, students will possess the following knowledge and skills: **Knowledge** • demonstrate knowledge of big data management, predictive modeling using machine learning/statistical methods, and model validation and evaluation • demonstrate knowledge of analytics project requirements, data acquisition and visualization, and business communication/presentation **Skills**

	• demonstrate the ability to convert client's business (or problem domain) into analytics project requirements • demonstrate the ability to collect data from social media and corporate databases, to assess data quality assessment, and provide analysis in terms of exploratory data analysis and data visualization • demonstrate the ability to clean and transform raw data sets for further data analytics processes • demonstrate the ability to use various machine learning & statistical modeling techniques (e.g., regression, classification) and algorithms (e.g., hierarchical clustering, association) to the data, including feature engineering and parameter optimization • demonstrate the ability to use proper model validation (e.g., cross validation) and evaluation methods and performance metrics (e.g., prediction accuracy) • demonstrate the ability to interpret model outputs, develop managerial and technical implications and express oneself clearly, accurately, and professionally in both oral and written form
4. Demand/Need for the Program	Firms' demands for professionals with data analytics skills and knowledge are increasing (e.g., employment in all computer occupations is expected to increase by 22% by 2020, according to the U.S. Bureau of Labor Statistics[1]) and academia is responding to the demands by developing new techniques and providing data analytics courses at undergraduate and graduate levels. According to the McKinsey & Company big data report, by 2018, the United States alone could face a shortage of 140,000 to 190,000 people with deep analytical skills (Figure 1). The study also projects that the U.S. needs 1.5 million data savvy managers and analysts who can manage and analyze large datasets, and utilize the findings in their decision making. In 2016 there were **295,755** master's level jobs nationally in the most common target occupations for data analytics graduates. These jobs are expected to grow by **8.6%** over the next five years. Over **1.2M** jobs requesting these skills have been posted during the last three years. It appears the national job market is still quite strong for master's level graduates in data analytics. The median salary is very high at **$103,320**. **Education Advisory Board (EAB)** recently published a webinar with additional findings on Data Analytics. They did an extensive search on jobs that were not specific to data analysis or data science, but that were requesting some level of expertise in these areas for other positions. They defined these positions as "citizen data scientists" who are expected to leverage predictive or prescriptive analytics in some capacity, but are not primarily employed as analysts. EAB reports that there were an additional **400,000** job listings that could fit this description in 2016, and that jobs requesting some level of data analytics skills, in non-data analytics professions, grew by **24%** in the last three years. They used the example of a marketing manager who is now expected to utilize these skills as part of evaluating the effectiveness and impact of marketing campaigns. When considered regionally within Kansas

and surrounding states, there were **591** completions and to **1723** openings in 2016, Salary trails the rest of the United States slightly at **$96,820**.

In summary, we expect that job growth and demand for a master's degree in data science or data analytics will enjoy excellent job prospects, both regionally and nationally, and current graduation rates are not outpacing expected job openings. The considerable job opportunities will continue to attract students to the data analytics related graduate degree programs.Accordingly, we expect the demand for this proposed degree program will be as follows:

- Year One: 5 (3 full-time, 2 part-time): We cannot promote the program until it is approved. Thus, the first-year enrollment is likely to be low and would not reflect true market demand.
- Year Two: 15 (10 full-time, 5 part-time)
- Year Three: 25 (20 full-time, 5 part-time)

The proposed program targets recent undergraduate and graduate students from different disciplines (engineering, computer science, mathematics, and science), K-State staff, and young professionals with the need to develop skills of data analytics at work. The impact on current MBA program enrollment should be minimal, since the two programs target very different groups of students, with very different curriculum. Furthermore, the experience from other, similar, graduate programs suggests there will be international students applying for this degree program.

5. Comparative /Locational Advantage

Currently, there are no other universities in the Kansas Board of Regents System (CAATE, 2016b) offering graduate degrees in data analytics. (University of Kansas offers Graduate Business Analytics Certificate.)

University	Program	Total Hours
Rockhurst University	MS in Bus Intelligence & Analytics	30
U of Missouri - Columbia	MS in Data & Analytics	34
Iowa State University	MS of Business Analytics	30
Oklahoma State University	MS in Business Analytics	33-37
Texas Tech University	MS in Data Science	36
University of Oklahoma	MS in Management Information Technology	32
North Carolina State University	MS in Analytics	30
University of Colorado – Boulder	MS in Business Analytics	33
University of Texas of San Antonio	MS in Data Analytics	30
University of Texas of Austin	MS in Business Analytics	36

	The proposed degree program is unique, combining courses from various disciplines that cover both data science and applied analytics. Such an integrated curriculum offers the students flexibility in choosing a track that fits their interests and background, which should be able to attract more quality students.
6. Curriculum	**A. Admission Criteria** The Graduate School admission's procedures at Kansas State University will be followed for the master's degree, which requires approval of the Dean of the Graduate School, upon the recommendation of faculty in the program. Students must hold a bachelor's degree from an accredited college or university and have an undergraduate GPA of 3.0 or higher in the last 60 hours of coursework, or a cumulative GPA of 3.0 or higher. International students must demonstrate similar levels of achievement (i.e., hold a degree from an established institution comparable to a college or university in the United States, have an outstanding undergraduate record, have the demonstrated ability to do graduate work, and provide evidence of language proficiency sufficient for the pursuit of a graduate degree). The Graduate School requires international students, whose native language is not English, to demonstrate competence in the English language by achieving a satisfactory score on the Test of English as a Foreign Language (TOEFL), the International English Language Testing System (IELTS), or the Pearson Test of English (PTE). These admission requirements will help ensure that students possess the content background and skills necessary for success. **B. Coursework** Students will be required to complete 30 hours of coursework: 21 hours of required and 9 hours of electives (Data Science track or Applied Analytics track). • **21 Hours of Cores** CIS 798/731: Programming Techniques for Data Science & Analytics (3 hrs) (F) ECON 630 Intro to Econometrics (3 hrs) (F,S) IMSE 785: Big Data Analytics (3 hrs) (S) MANGT 830: Information Technology Strategy and Application (3 hrs) (F) MIS 665: Business Analytics and Data Mining (3 hrs) (F,S) MIS 670: Social Media Analytics and Web Mining (3 hrs) (F,S) MKTG 880: Applied Marketing Analytics (3 hrs) (S) • **9 Hours of Track Electives** *Track #1: Data Science* CIS 730: Principles of Artificial Intelligence (3 hrs) (S) CIS 732: Machine Learning and Pattern Recognition (3 hrs) (F,S) CIS 751: Computer and Information Security (3 hrs) (F) CIS 833: Information Retrieval and Text Mining (3 hrs) (F) MATH 725: The Mathematics of Data and Network I (3 hrs) (F) MATH 726: The Mathematics of Data and Network II (3 hrs) (S)

	STAT 717: Categorical Data Analytics (3 hrs) (S) STAT 730: Multivariate Statistical Methods (3 hrs) (S) *Track #2: Applied Analytics* ACCTG 856: Accounting Analytics (3 hrs) (S,Su) CIS 732: Machine Learning and Pattern Recognition (3 hrs) (F,S) ECON 686: Economic Forecasting (3 hrs) (F,S) FINAN 623: Financial Modeling (3 hrs) (F,S) GEOG 608: Geographic Information Systems II (3 hrs) (F) GEOG 712: Internet GIS and Distributed Geographic Information Services (3 hrs) (S) GEOG 728: Topics in Programming for Geographic Analysis (3 hrs) (F,S) GEOG 808: Geocomputation (3 hrs) (S) MANGT 662: Procurement, Logistics and Supply Chain Design (3 hrs) (S) MKTG 881: Advanced Marketing Analytics (3 hrs) (F) **Program Total of 30 Hours**
7. Faculty Profile	**Tenured/Tenure-Track Faculty:** There are a total of 19 tenured/tenure-track faculty members (6 for required/core courese and 13 for electives) involved in teaching this program. Since all program courses (both cores and electives) are currently offered, there is no additional course or faculty resource is required. Table 1 lists the faculty members and the courses included in this proposed program.
8. Student Profile	The proposed program targets recent undergraduate and graduate students from different disciplines, K-State staff seeking for professional development, and young professionals with the need to develop skills of data analytics at work. The experience from other, similar graduate programs in the region also suggests there will be international students applying for this degree program.
9. Academic Support	Academic support for this program will be provided through existing resources, offered by ten different departments: Accounting, Finance, Management, Marketing, IMSE, Economics, Geography, Computer Science, Statistics, and Mathematics. Therefore, academic support for this program will be provided through existing resources.
10. Facilities and Equipment	No new facilities or equipment will be needed to implement this new major.
11. Program Review, Assessment, Accreditation	The MS-DA will be subject to continuous review by graduate faculty in the Graduate Innovative Curriculum Committee of the College of Business Administration. Faculty will be invited to raise issues and help solve problems. Students will be asked to complete surveys at the mid-point and conclusion of their program to help faculty improve various aspects of the program. Data from the surveys and student assessments will be aggregated, reported, and used for program refinement and improvement. The program will also be subject to accreditation review by the AACSB. **A. Student Learning Outcome**

SLO 1. Business Understanding: Students demonstrate the ability to convert client's business (or problem domain) into analytics project requirements

SLO 2. Data Assessment: Students demonstrate the ability to collect data from social media and corporate databases, to assess data quality assessment, and provide analysis in terms of exploratory data analysis and data visualization

SLO 3. Data Preparation: Students demonstrate the ability to clean and transform raw data sets for further data analytics processes

SLO 4. Model Building: Students demonstrate the ability to use various machine learning & statistical modeling techniques (e.g., regression, classification) and algorithms (e.g., hierarchical clustering, association) to the data, including feature engineering and parameter optimization

SLO 5. Model Evaluation: Students demonstrate the ability to use proper model validation (e.g., cross validation) and evaluation methods and performance metrics (e.g., prediction accuracy.

SLO 6. Storytelling: Students demonstrate the ability to interpret model outputs, develop managerial and technical implications and express oneself clearly, accurately, and professionally in both oral and written form

B. Assessment Strategies

a. **Direct Measures** *(The rubrics used to assess student learning outcomes are included in Appendix A.)*

The faculty members will use the rubrics in Appendix A to access each student's learning outcome. The data will be collected at three core courses: MANGT 830, MIS 670, and MKTG 880, respectively.

The following Course-SLO Alignment table illustrates the assessment methods for the direct measures.

SLO	Assessment Type	Relates to	Assessment Course
1. Business Understanding	Term project	Knowledge and Skills	MANGT 830
2. Data Assessment	Class assignment	Knowledge and Skills	MIS 670
3. Data Preparation	Class assignment	Knowledge and Skills	MIS 670
4. Model Building	Class assignment	Knowledge and Skills	MKTG 880
5. Model Evaluation	Class assignment	Knowledge and Skills	MKTG 880
6. Storytelling	Term project	Professional and Attitude, Communication Skills	MANGT 830

	SLO 2, 3, 4, and 5 are directly assessed in MIS 670 or MKTG 880 courses. MANGT 830 is the capstone course and will be used to review the overall student culminating learning experience and measure two specific learning outcomes, SLO 1 and SLO 6. In this capstone course, students re-examine their data analytics experiences within the context of organizational and strategic constraints, which will enhance their understanding of how data analytics affects decision-making in an organization. For the capstone term project, students should select a previously analytics project completed during the program and enhance it to demonstrate their understanding of business value and why a project must take a strategic perspective. They comprehensively will apply their skills and knowledge to solve and communicate their solution for a business problem. The term project should be presented, professionally in both written and verbal forms, so the instructor can assess two learning outcomes: SLO 1: Business Understanding and SLO 6: Storytelling. ***b.*** **Indirect Measures** (*Any surveys planned used should be in Appendix B.)* All students will complete the program exit survey (Appendix B). This data will assist the Graduate Innovative Curriculum Committee of the College of Business Administration to evaluate and improve the program. **C. Results and Review of Student Learning Outcomes and Assessment Strategies** • The Graduate Curriculum Committee will review assessment results annually within two weeks of the conclusion of the Spring semester. • The Graduate Curriculum Committee will review the exit survey results and assessment results during its annual meeting and provide suggestions to improve the program.
12. Costs, Financing	There are no additional costs anticipated for this program.

PROGRAM PROPOSAL NARRATIVE

1. PROGRAM JUSTIFICATION

Data analytics is the skills, technologies, and practices for continuous iterative exploration and investigation of past business performance to gain insights and drive business planning.[2] Data analytics is central to understanding consumers and taking advantage of many opportunities in the recent business environment. Technology advancement (e.g., Internet of Things) has enabled firms to digitalize and store various types of information of not only numbers but also text, voice, image, locations, movements, etc. Firms analyze consumer behavior and market environment with state-of-the-art machine learning algorithms as well as traditional statistics and econometrics. As a result, firms can plan and implement many business strategies based on analytics results.

Firms' demands for professionals with data analytics skills and knowledge are increasing (e.g., employment in all computer occupations is expected to increase by 22% by 2020, according to the U.S. Bureau of Labor Statistics[3]) and academia is responding to the demands by developing new techniques and providing data analytics courses at undergraduate and graduate levels[4]. According to the McKinsey & Company big data report, by 2018, the United States alone could face a shortage of 140,000 to 190,000 people with deep analytical skills (Figure 1).[5] The study also projects that the U.S. needs 1.5 million data savvy managers and analysts who can manage and analyze large datasets, and utilize the findings in their decision making.

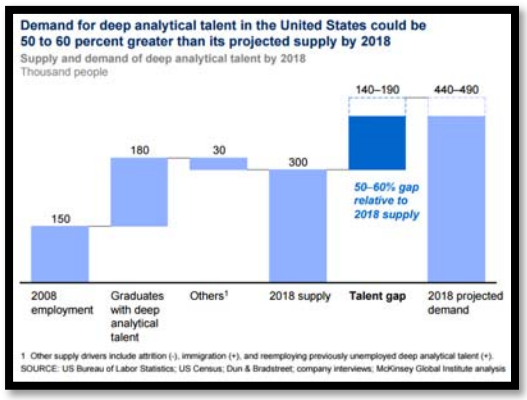

Figure 1. Data analytics talent gap

A. MS – Data Analytics Job Market: United States and Regionally (EMSI[6])

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[2] Wikipedia, June 20, 2009, *Business analytics*, https://en.wikipedia.org/wiki/Business_analytics

[3] Patrick Thibodeau, March 29, 2012, *IT Jobs Will Grow 22% through 2020, Says U.S.*, Computerworld, http://www.computerworld.com/article/2502348/it-management/it-jobs-will-grow-22--through-2020--says-u-s-.html?page=1

[4] Amy Hillman, May 14, 2013, *The Rise in Business-Analytics Degrees*, Huffpost, http://www.huffingtonpost.com/amy-hillman/the-rise-in-businessanaly_b_3273749.html

[5] James Manyika et al., May 2011, *Big Data: The Next Frontier for Innovation, Competition, and Productivity*, McKinsey Global Institute, http://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/big-data-the-next-frontier-for-innovation

[6] EMSI 2017.3, http://www.economicmodeling.com

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Education Advisory Board (EAB) recently published a webinar with additional findings on Data Analytics. They did an extensive search on jobs that were not specific to data analysis or data science, but that were requesting some level of expertise in these areas for other positions. They defined these positions as "citizen data scientists" who are expected to leverage predictive or prescriptive analytics in some capacity, but are not primarily employed as analysts. EAB reports that there were an additional **400,000** job listings that could fit this description in 2016, and that jobs requesting some level of data analytics skills, in non-data analytics professions, grew by **24%** in the last three years. They used the example of a marketing manager who is now expected to utilize these skills as part of evaluating the effectiveness and impact of marketing campaigns. When considered regionally within Kansas and surrounding states, there were **591** completions and to **1723** openings in 2016, Salary trails the rest of the United States slightly at **$96,820**.

In summary, we expect that job growth and demand for a master's degree in data science or data analytics will enjoy excellent job prospects, both regionally and nationally, and current graduation rates are not outpacing expected job openings. The considerable job opportunities will continue to attract students to the data analytics related graduate degree programs.

B. MS – Data Analytics Programs

Many colleges and universities have already responded to this growing need for analytical talent. As of August 2016, 532 colleges and universities across the U.S. already offer data analytics programs[7]. These programs are diverse in terms of target audiences (e.g., undergraduate, masters), delivery method (e.g., online, on campus), and objectives (e.g., data savvy, data scientist). The College of Business at K-State works across the campus with six departments (Computer Science, Economics, Geography, Industrial Manufacturing Systems Engineering, Mathematics, Statistics) to propose a graduate degree program in data analytics, aiming to become the first graduate program in Kansas, with a unique program. Specifically, unlike other DA graduate programs in the region, such as Colorado, Iowa, Missouri, and Oklahoma, this proposed program is supported by multiple academic units. It covers required qualifications, such as data science, analysis skills, and business management. The program builds on the success of the established Data Analytics Graduate Certificate program, in which students learn data science techniques offered by the Departments of Computer Science (CS), Statistics (STAT), and Mathematic (MATH), and analytic skills/business applications provided by the Departments of Economics (ECON), Geography (GEOG), IMSE, and the College of Business (Accounting, Finance, Marketing, Management). The proposed program is an expanded version of the current Data Analytics graduate certificate program that includes additional courses in data

[7] Colleges with Data Science Degrees [available at http://101.datascience.community/2012/04/09/colleges-with-data-science-degrees/]

science, analytics skills, and business management offered on campus by the top-class faculty in relevant departments and colleges. The proposed program targets recent undergraduates and graduate students from different disciplines, and young professionals with the need to develop data analytics skills. The program also aims to build a partnership with local and nation-wide companies to improve students' understandings of real business issues, and contribute to the partner companies by providing new solutions and potential competent employees.

In summary, Data Analytics is a field with excellent growth prospects. Currently, there are more job opportunities than graduates in these high demand fields, especially if the degree allows those from other specializations to enter and gain skills they can apply to their existing occupations.

C. Centrality to Mission

(a) Is the Program Central to the Mission of the Institution?

The mission of Kansas State University is to foster excellent teaching, research, and service as well as to develop a highly skilled and educated citizenry necessary to advancing the well-being of Kansas, the nation, and the international community. The university embraces diversity, encourages engagement and is committed to the discovery of knowledge, the education of undergraduate and graduate students, and improvement in the quality of life and standard of living of those we serve. As a comprehensive, research, land-grant institution, Kansas State University dedicates itself to developing human potential, expanding knowledge, enriching cultural expression, and extending its expertise to individuals, businesses, education, and government.

The mission of the College of Business Administration at Kansas State University is excellence in the advancement and dissemination of knowledge consistent with the needs of students, business, faculty, and society.

We believe this collaborative curriculum will provide students with the necessary skills and knowledge to find secure, professional jobs, provide companies scientific and systematic methods of decision- making, and provide involved faculty members opportunities to improve their professional and research skills by utilizing real business issues. In a long-term perspective, the MS-DA degree program, corresponding to the new trend of data analytics, will foster a higher quality reputation of Kansas State University and will locally and globally increase recognition of the university.

Theme 1: Research, Scholarly and Creative Activities, and Discovery
Create a culture of excellence that results in flourishing, sustainable, and widely recognized research, scholarly and creative activities, and discovery in a variety of disciplines and endeavors that benefit society as a whole.

Several courses in this proposed program include a term project requiring students to apply the skills/knowledge learned to resolve real-life problems. Some of these term projects have been further developed into student-led research projects and publications. For instance, a term project ("Investigating dining experiences at Chinese restaurants using user-generated content and topic

modeling") led by Xiaoye Li (doctoral student at the Department of Hospitality Management) and Willie C. Tao (former doctoral student at the Department of Hospitality Management and current Assistant Professor at Oklahoma State University) was presented at the 21st Graduate Education & Graduate Student Research Conference in Hospitality & Tourism (January 2016), and received the best paper award at the conference. Two other term projects by Woohyuk Kim (doctoral student in the Department of Hospitality Management) and Eunhye Park (doctoral student in the Department of Hospitality Management) also received the best paper award from the 22nd Graduate Education & Graduate Student Research Conference in Hospitality & Tourism (January 2017) and the 2nd Annual Central Federation CHRIE Regional Conference (March 2017), respectively. More information about these projects can be found on the following K-State Today announcement pages:
http://www.k-state.edu/today/announcement.php?id=33298
http://www.k-state.edu/today/announcement.php?id=31778
http://www.k-state.edu/today/announcement.php?id=24328

Theme 2: Undergraduate Educational Experience
Build a connected, diverse, empowered, engaged, participatory culture of learning and excellence that promotes undergraduate student success and prepares students for their professional, community, social, and personal lives.

- Not applicable for this proposal.

Theme 3: Graduate Scholarly Experience
Advance a culture of excellence that attracts highly talented, diverse graduate students and produces graduates
recognized as outstanding in their respective professions.

Data Analytics is a fast-growing discipline with great job opportunities and, nationwide, it is a highly pursued degree program. The proposed degree program will attract highly-talented students, with various backgrounds (business, engineering, science, arts), from various areas (undergraduate students, graduate students, young professionals). Based on the experience of other similar programs in the nation, the proposed program would also attract many international students to Kansas State University. Overall, the purpose of this program is to recruit a diverse group of talented students and to develop them into highly skilled professionals in data analytics.

Theme 4: Engagement, Extension, Outreach, and Service
Be a national leader and model for a re-invented and transformed public research land-grant university integrating research, education, and engagement.

Many faculty members in this proposed program have already been conducting data analytics projects with companies in the state of Kansas as well as from other national and international locations. The proposed program will continue its community engagement through course projects, and will seek out research opportunities to provide evidence and data that can be shared with the state of Kansas. The students will be directly involved in faculty research projects in data analytics.

Theme 5: Faculty and Staff
Foster a work environment that encourages creativity, excellence, and high morale in faculty and staff, responds to changing needs, embraces diversity, values communication and collaboration, and is respectful, trusting, fair, and collegial for all.

The proposed program will broaden the perspectives of faculty by fostering a more diverse student body and increasing connections with the business community. Such experience will, in turn, increase research opportunities and improve research productivity.

Program development and demand will create needs for additional communication, collaboration, and high-quality faculty.

Theme 6: Facilities and Infrastructure
Provide facilities and infrastructure that meet our evolving needs at a competitive level with our benchmark
institutions and are an asset to recruit and retain quality students, faculty, researchers, and staff.

Kansas State University is behind in its development of data analytics graduate education, compared to our peer institutes. Without a good graduate program in data analytics, we are missing a great opportunity to recruit and retain quality graduate students. This proposed degree program integrates courses from various disciplines / colleges, and it has the quality and niche to be one of the premier graduate data analytics programs in the area. It will help recruit and retain quality students and enrich the university-wide faculty research agendas in the area of data analytics

(b) What is the Student Demand for the Program? What are the Characteristics of the Students Who Will Participate in the Program?

In 2016, there were **591** completions and to **1723** openings within Kansas and surrounding states, similar to the national ratio. It is expected that job growth and demand for a master's degree in data science or data analytics will result in excellent job prospects, both regionally and nationally, over the next 5 years. Graduation rates are not currently outpacing the expected job openings (EMSI, http://www.economicmodeling.com/). Additionally, the considerable pay opportunities will likely continue to attract students to these fields. Accordingly, we expect the demand for this proposed degree program will be as follows:

- Year One: 5 (3 full-time, 2 part-time): We cannot promote the program until it is approved. Thus, the first-year enrollment is likely to be low and would not reflect true market demand.
- Year Two: 15 (10 full-time, 5 part-time)
- Year Three: 25 (20 full-time, 5 part-time)

The proposed program targets recent undergraduate and graduate students from different disciplines (engineering, computer science, mathematics, and science), K-State staff, and young

professionals with the need to develop skills of data analytics at work. The impact on current MBA program enrollment should be minimal, since the two programs target very different groups of students, with very different curriculum. Furthermore, the experience from other, similar, graduate programs suggests there will be international students applying for this degree program.

(c) Locational and Comparative Advantages

Currently, there are no other universities in the Kansas Board of Regents System (CAATE, 2016b) offering graduate degrees in data analytics. (University of Kansas offers Graduate Business Analytics Certificate.) A comparison of master's degree programs from institutions in bordering states is provided below.

University	Program	Total Hours	Remark
Rockhurst University	MS in Bus Intelligence & Analytics	30	No data science courses
U of Missouri - Columbia	MS in Data & Analytics	34	No data science courses A STEM program
Iowa State University	MS of Business Analytics	30	An online program No data science courses
Oklahoma State University	MS in Business Analytics	33-37	No data science courses A STEM program
Texas Tech University	MS in Data Science	36	A STEM program
University of Oklahoma	MS in Management Information Technology	32	A STEM program
North Carolina State University	MS in Analytics	30	A STEM program
University of Colorado – Boulder	MS in Business Analytics	33	No data science courses A STEM program
University of Texas of San Antonio	MS in Data Analytics	30	A STEM program
University of Texas of Austin	MS in Business Analytics	36	No data science courses A STEM program

Many programs are offered as a STEM program, even though data science courses are not included. The proposed degree program is unique, combining courses from various disciplines that cover both data science and applied analytics. Such an integrated curriculum offers the students flexibility in choosing a track that fits their interests and background, which should be able to attract more quality students.

2. CURRICULUM OF THE PROPOSED PROGRAM

In its recent report, EAB included a list of the most requested "Hard" and "Soft" skills for master's level job candidates. This is included to give a sense of what program elements will be

needed to create a degree that will allow students to be job competitive. These jobs most commonly request high-level business skills, such as operations, management, finance, reporting, problem-solving, presentations, innovation, etc. Farther down the list are specific processes or tools such as Lean Six Sigma, forecasting, data collection, statistical software packages, or specific programming languages. These emphasize the need to include business skills as part of a master's program, so students can translate data into actionable processes that apply to how the business operates. Other, more commonly requested soft skills include project management, coordinating, creativity, and critical thinking. Accordingly, the proposed degree program developed the following learning objectives and collaborative curriculum.

(a) Describe the More Important Academic Objectives of the Proposed Program, Including the Range of Skills and Knowledge Future Graduates will Possess.

This Master of Science – Data Analytics (MS-DA) program is a graduate program, in collaboration with the Departments of Computer Science, Economics, Mathematics, Industrial Management and Systems Engineering, Statistics, and Geography, focusing on using advanced technologies to manipulate big data, utilizing rigorous methods to interpret the data, and obtaining the business skills necessary to translate understanding into actionable organizational strategies. Specifically, upon completion of the Master of Science – Data Analytics program, students will possess the following knowledge and skills:

Knowledge

- demonstrate knowledge of big data management, predictive modeling using machine learning/statistical methods, and model validation and evaluation
- demonstrate knowledge of analytics project requirements, data acquisition and visualization, and business communication/presentation

Skills

- demonstrate the ability to convert client's business (or problem domain) into analytics project requirements
- demonstrate the ability to collect data from social media and corporate databases, to assess data quality assessment, and provide analysis in terms of exploratory data analysis and data visualization
- demonstrate the ability to clean and transform raw data sets for further data analytics processes
- demonstrate the ability to use various machine learning algorithms (e.g., hierarchical clustering, association) & statistical modeling techniques (e.g., regression, classification) to the data, including feature engineering and parameter optimization
- demonstrate the ability to use proper model validation (e.g., cross validation) and evaluation methods and performance metrics (e.g., prediction accuracy)
- demonstrate the ability to interpret model outputs, develop managerial and technical implications, and express oneself clearly, accurately, and professionally in both oral and written form

(b) The coursework required of all students who major in this program shall be described.

Students will be required to complete 30 hours of coursework: 21 hours of required and 9 hours of electives (Data Science track or Applied Analytics track).

21 Hours of Required

CIS 798/731: Programming Techniques for Data Science & Analytics (3 hrs) (F)
ECON 630 Intro to Econometrics (3 hrs) (F,S)
IMSE 785: Big Data Analytics (3 hrs) (S)
MANGT 830: Information Technology Strategy and Application (3 hrs) (F)
MIS 665: Business Analytics and Data Mining (3 hrs) (F,S)
MIS 670: Social Media Analytics and Web Mining (3 hrs) (F,S)
MKTG 880: Applied Marketing Analytics (3 hrs) (S)

9 Hours of Track Electives

Track #1: Data Science
CIS 730: Principles of Artificial Intelligence (3 hrs) (S)
CIS 732: Machine Learning and Pattern Recognition (3 hrs) (F,S)
CIS 751: Computer and Information Security (3 hrs) (F)
CIS 833: Information Retrieval and Text Mining (3 hrs) (F)
MATH 725: The Mathematics of Data and Network I (3 hrs) (F)
MATH 726: The Mathematics of Data and Network II (3 hrs) (S)
STAT 717: Categorical Data Analytics (3 hrs) (S)
STAT 730: Multivariate Statistical Methods (3 hrs) (S)

Track #2: Applied Analytics
ACCTG 856: Accounting Analytics (3 hrs) (S,Su)
CIS 732: Machine Learning and Pattern Recognition (3 hrs) (F,S)
ECON 686: Economic Forecasting (3 hrs) (F,S)
FINAN 623: Financial Modeling (3 hrs) (F,S)
GEOG 608: Geographic Information Systems II (3 hrs) (F)
GEOG 712: Internet GIS and Distributed Geographic Information Services (3 hrs) (S)
GEOG 728: Topics in Programming for Geographic Analysis (3 hrs) (F,S)
GEOG 808: Geocomputation (3 hrs) (S)
MANGT 662: Procurement, Logistics and Supply Chain Design (3 hrs) (S)
MKTG 881: Advanced Marketing Analytics (3 hrs) (F)

A suggested schedule

	Fall	Spring
Year 1	MIS 665, ECON 630, CIS 798/731	IMSE 785, MIS 670, MKTG 880, Elective #1
Year 2	MANGT 830, Elective #2, Elective #3	

Prerequisites: Introductory Statistics course OR introductory Economics course

Admission Requirements:

3.0 GPA, Stat 350, Stat 351 (or equivalent statistics courses); Familiarity with computer programming/applications is highly recommended; relevant work/internship experience preferred;

3. PROGRAM FACULTY

No additional course or faculty resource is required for the proposed degree program. The current faculty includes:

Name/Degree	Tenure Status/Title	Dept	Instructional Expectation & Academic Specialization
Core courses			
William Hsu, Ph.D.	Tenured, Professor	CS	CIS 730, CIS 798/731, CIS 732
Yoon-Jin Lee, Ph.D.	Non-tenured, Assistant Professor	ECON	ECON 630
Shing I Chang, Ph.D.	Tenured, Associate Professor	IMSE	IMSE 785
Roger McHaney, Ph.D.	Tenured, Professor	MANGT	MANGT 830
Bongsug Chae, Ph.D.	Tenured, Professor	MANGT	MIS 665, MIS 670
Jaebeom Suh, Ph.D.	Tenured, Associate Professor	MKTG	MKTG 880
Electives			
Sungha Jang, Ph.D.	Non-tenured, Assistant Professor	MKTG	MKTG 881
John Morris, Ph.D.	Tenured, Associate Professor	ACCTG	ACCTG 856
Ansley Chua, Ph.D.	Tenured, Associate Professor	FINAN	FINAN 623
Myung Kyo Kim, Ph.D.	Non-tenured, Assistant Professor	MANGT	MANGT 660
Douglas G Goodin	Tenured, Professor	GEOG	GEOG 808
James Hutchinson, Ph.D.	Tenured, Associate Professor	GEOG	GEOG 728, GEOG 712, GEOG 608
Lance J. Bachmeier, Ph.D.	Tenured, Associate Professor	ECON	ECON 686
George Amariucai, Ph.D.	Tenured, Associate Professor	CS	CIS 751
Doina Caragea, Ph.D.	Tenured, Associate Professor	CS	CIS 833
Petro Poggi-Corradini, Ph.D.	Tenured, Professor	MATH	MATH 725
Andrew Bennett, Ph.D.	Tenured, Professor	MATH	MATH 726
Perla E. Reyes Cuellar, Ph.D.	Tenured, Associate Professor	STAT	STAT 730
Abigail Jager, Ph.D.	Tenured, Associate Professor	STAT	STAT 717

4. PROGRAM REVIEW, ASSESSMENT, AND ACCREDITATION

Program review will fall within the responsibilities of the Graduate Programs of the College of Business Administration and will be reviewed when its programs are reviewed.

4.1 Program Review Process Methods

The MS-DA will be subject to continuous review by Graduate Innovative Curriculum Committee of the College of Business Administration. Program faculty will be invited to review the assessment results and discuss improvement. Students will be asked to complete surveys at the conclusion of their program to help faculty improve various aspects of the program (Appendix B). Data from the surveys and student assessments will be aggregated, reported, and used for program refinement and improvement. The program will also be subject to accreditation review by the AACSB.

4.2 Student Learning Outcome(s)

a. **List (or attach a list) all the student learning outcomes for the program.**
The program has two terminal learning objectives with six enabling learning objectives that support completion of this degree program:

Terminal Learning Objective 1: Students will convert a client's business problems into analytics project requirements, collect data from diverse sources including social media and corporate databases, and learn to prepare and transform large data sets.

Terminal Learning Objective 1 is accomplished with the following Enabling Learning Objectives (ELO):

- **ELO 1. Business Understanding**: Demonstrate ability to convert client's business (or problem domain) into analytics project requirements
- **ELO 2. Data Assessment**: Demonstrate ability to collect data from social media and corporate databases, to assess data quality assessment, and provide analysis in terms of exploratory data analysis and data visualization
- **ELO 3. Data Preparation**: Demonstrate ability to clean and transform raw data sets for further data analytics processes such as exploratory data analysis and model building

Terminal Learning Objective 2: Students will build predictive models using machine learning/statistical methods, apply proper model validation and evaluation techniques, and extract valuable insights from predictive models and data analysis.

Terminal Learning Objective 2 is accomplished with the following Enabling Learning Objectives:

- **ELO 4. Model Building**: Demonstrate ability to use various machine learning algorithms (e.g., hierarchical clustering, association) & statistical modeling techniques (e.g., regression, classification) to the data, including feature engineering and parameter optimization
- **ELO 5. Model Evaluation**: Demonstrate ability to use proper model validation (e.g., cross validation) and evaluation methods and performance metrics (e.g., prediction accuracy)

- **ELO 6. Storytelling**: Demonstrate the ability to interpret model outputs, develop managerial and technical implications, and express oneself clearly, accurately, and professionally in both oral and written form

b. **Indicate at least three outcomes on the above list that will be assessed by the first mid-cycle review.**

ELO 2 (Data assessment), ELO 3 (Data preparation), ELO 4 (Model building), and ELO (Model evaluation) will be assessed in two core courses: MIS 670 and MKTG 880, respectively.

Specify the rationale for selecting these learning outcomes:
A data analytics project includes a series of activities, including business understanding, data collection, data transformation and visualization, predictive model building, model validation, model evaluation, and storytelling. Students should be able to demonstrate his/her skills and knowledge in all these areas. Thus, it is appropriate to access all ELOs.

4.3 Assessment Strategies

How will each of the learning outcomes be assessed?

a. **Direct Measures** *(If rubrics will be used to assess any aspect of the student learning outcomes, the rubrics should be included in Appendix A.)*

The faculty members will use the rubrics in Appendix A to access each student's learning outcome. The data will be collected at three core courses: MANGT 830, MIS 670, and MKTG 880, respectively.

The following Course-ELO Alignment table illustrates the assessment methods for the direct measures.

ELO	Assessment Type	Relates to	Assessment Course
1. Business Understanding	Term project	Knowledge and Skills	MANGT 830
2. Data Assessment	Class assignment	Knowledge and Skills	MIS 670
3. Data Preparation	Class assignment	Knowledge and Skills	MIS 670
4. Model Building	Class assignment	Knowledge and Skills	MKTG 880
5. Model Evaluation	Class assignment	Knowledge and Skills	MKTG 880
6. Storytelling	Term project	Professional and Attitude, Communication Skills	MANGT 830

ELO 2, 3, 4, and 5 are directly assessed in MIS 670 or MKTG 880 courses. MANGT 830 is the capstone course and will be used to review the overall student culminating learning experience

and measure two specific learning outcomes, ELO 1 and ELO 6. In this capstone course, students re-examine their data analytics experiences within the context of organizational and strategic constraints, which will enhance their understanding of how data analytics affects decision-making in an organization. For the capstone term project, students should select a previously analytics project completed during the program and enhance it to demonstrate their understanding of business value and why a project must take a strategic perspective. They comprehensively will apply their skills and knowledge to solve and communicate their solution for a business problem. The term project should be presented, professionally in both written and verbal forms, so the instructor can assess two learning outcomes: ELO 1: Business Understanding and ELO 6: Storytelling.

b. **Indirect Measures**

   All students will complete the program exit survey (Appendix B). This data will assist the Graduate Innovative Curriculum Committee of the College of Business Administration to evaluate and improve the program.

c. **Number of students included in the assessment** (*Provide a rationale if you plan to sample only of subset of the students)*

   ALL

d. **Timetable** *(When will these outcomes be assessed? How will the data be collected? When will the data be collected? Who will collect the data?*)

   The learning objectives will be measured and collected when students attend the courses. In addition to these direct measures, students will complete the program exit survey. The survey (Appendix B) will be conducted electronically and the data will be collected and analyzed by the program steering committee.

4.4. Results and Review of Student Learning Outcomes and Assessment Strategies

a. Describe the process the faculty will follow to review the results of assessment data.

The Graduate Curriculum Committee will review assessment results annually within two weeks of the conclusion of the Spring semester. Since the program relies on a numeric rubric for assessment, the initial student learning objective will be that 80% of the students achieve a combined score of 10 or above for Terminal Learning Objective 1 and that 80% of the students achieve a score of 10 or above for Terminal Learning Object 2. A further goal is that 75% of the students will achieve scores at 3 or above for all 6 Enabling Learning Objectives.

b. Describe any other program improvement procedures that will be followed (e.g. formative assessments of delivery method, corporate or employer surveys).

The Graduate Curriculum Committee will review the exit survey results and assessment results during its annual meeting and provide suggestions to improve the program. The numeric assessment targets will be reviewed each year and new achievement goals will be set. Likewise, the TLOs and ELOs will be reviewed yearly and adjusted as technologies and knowledge in the area of data analytics grows and matures.

Appendix A. Assessment Rubrics

ELO 1. Business Understanding: The ability to convert client's business (or problem domain) into analytics project requirements

	Target 4	**Competent 3**	**Basic 2**	**Unsatisfactory 1**
Business Problem Formulation *Ability to understand business problem based on information provided by a business client*	Demonstrates a clear understanding of a business problem based on information provided by a client and articulates effective business practices dealing with such problem.	Demonstrates a clear understanding of a business problem based on information provided by a client but does not clearly articulate effective business practices to deal with the problem.	Demonstrates a somewhat accurate understanding of information presented by a business client with minor errors in understanding the client's business problem.	Attempts to explain information presented by a business client, but exhibits an incorrect understanding of what the information means.
Analytical Process *Ability to explain what is required to solve business problem using data analytics*	Provides accurate explanations of what is required to solve business problems using data analytics supported with comparisons of similar data analytics projects from industry.	Provides accurate explanations of what is required to solve business problem using data analytics without providing support for their solutions.	Provides somewhat accurate explanations of what is required to solve business problem using data analytics, but makes minor errors in explaining analytical project requirements	Attempts to translate business problem to an analytical project, but develops an incorrect understanding of analytical project requirements.

ELO 2. Data Assessment: The ability to collect data from social media and corporate databases, to assess data quality, and provide data description and metadata

	Target 4	**Competent 3**	**Basic 2**	**Unsatisfactory 1**
Data Collection *Ability to collect data from various sources including social media platforms and websites*	Demonstrates an advanced level of skills in using analytical techniques (e.g., SQL, Web Crawling, APIs) for big data collection articulating pros and cons of data collection methods as well as emerging data collection technologies.	Demonstrates a proficient level of skills in using analytical techniques (e.g., SQL, Web Crawling, APIs) for big data collection articulating pros and cons of data collection methods without including emergent data collection technologies.	Demonstrates an adequate level of skills in using analytical techniques (e.g., SQL, Web Crawling, APIs) for big data collection, but neglects to consider the value of each.	Demonstrates basic knowledge in analytical techniques (e.g., SQL, Web Crawling, APIs) for data collection, but not adequate for big data collection.
Data Quality Assessment *Ability to determine quality issues with the collected data through initial data exploration*	Accurately identifies data quality issues and explains the causes and potential solutions.	Accurately identifies data quality issues and provides potential solutions without exploring the cause.	Demonstrates general description of data quality issues exhibiting a systematic approach.	Demonstrates only a basic knowledge of data quality issues, but the approach is not systematic.
Data Description *Ability to describe the collected in terms of metadata*	Clearly incorporates a systematic approach for using metadata to describe collected and exposes additional data sources and processes for acquisition.	Includes metadata in general terms while describing collected data using a systematic approach as well as some additional sources of data.	Demonstrates adequate knowledge and skills about data description and metadata creation, with a somewhat systematic approach suitable for big data.	Demonstrates basic knowledge and skills about data description and metadata creation, but with an approach not suitable for big data.

ELO 3. Data Preparation: The ability to clean and integrate raw data sets from various sources for further data analytics processes such as exploratory data analysis and model building

	Target **4**	**Competent** **3**	**Basic** **2**	**Unsatisfactory** **1**
Data Integration *Ability to integrate data from various sources*	Uses computationally-efficient techniques (e.g., Join, Merge, Append) and multiple languages (e.g., Python, SQL) for data integration and demonstrates good knowledge and skills in data structures.	Uses computationally-efficient techniques (e.g., Join, Merge, Append) for data integration and demonstrate good knowledge and skills in data structures, but lacking in the connection to multiple languages (e.g., Python, SQL).	Uses computationally-efficient techniques (e.g., Join, Merge, Append) for data integration, but not proficient in changing data structures (e.g., list, dataframe).	Demonstrates basic knowledge and analytical techniques integrating datasets, but the approach is slow and not systematic.
Data Wrangling *Ability to convert raw data to analytical data for further analysis*	Demonstrates advanced knowledge and analytical techniques for transforming both structured and unstructured data and data wrangling tasks are done using computational techniques and parallel computing algorithms.	Demonstrates knowledge and analytical techniques for transforming both structured and unstructured data and data wrangling tasks are done using computational techniques.	Demonstrates knowledge and analytical techniques for transforming structured data and data wrangling tasks are done using computational techniques, but lacking relevance to unstructured data.	Demonstrates basic knowledge and analytical techniques for transforming structured data, but some works are done manually.

ELO 4. Model Building: The ability to choose and use various machine learning algorithms & statistical modeling techniques

	Target **4**	**Competent** **3**	**Basic** **2**	**Unsatisfactory** **1**
Modeling Methods Choice *Ability to choose correct analysis methods based on data types and project purposes*	Chooses accurate and advanced modeling techniques to completely solve business problems, as the basis for deep and thoughtful judgments based on data types and purposes.	Chooses accurate but intermediate modeling techniques to provide qualified solutions, as the basis for competent judgments based on data types and purposes.	Chooses the basic modeling techniques to partially solve business problems, as the basis for workmanlike (without inspiration or nuance, ordinary) judgments without considering data types and/or purposes.	Chooses the partially accurate quantitative analysis of data, as the basis for tentative, basic judgments without considering data types and/or purposes.
Representation *Ability to convert relevant information into various mathematical forms (e.g., equations and graphs)*	Skillfully converts relevant information into an insightful, mathematical, portrayal in a way that contributes to a further or deeper understanding.	Competently converts relevant information into an appropriate and desired mathematical portrayal.	Completes conversion of information, but resulting mathematical portrayal is only partially appropriate or accurate.	Completes conversion of information, but resulting mathematical portrayal is inappropriate or inaccurate.

ELO 5. Model Evaluation: The ability to use proper model diagnostics and validation (e.g., cross validation), evaluation methods and performance metrics (e.g., prediction accuracy)

	Target **4**	**Competent** **3**	**Basic** **2**	**Unsatisfactory** **1**
Model Diagnostics *Ability to check statistical assumptions and provide remedies for violations*	Explicitly describes assumptions and provides compelling rationale for why each assumption is appropriate. Shows confidence in accurate remediation of violations.	Explicitly describes assumptions and provides compelling rationale for why assumptions are appropriate.	Explicitly describes assumptions with no supporting rationale.	Attempts but fails to proplerly describe assumptions.
Model Validation *Ability to generate estimation sample and various types of validation samples*	Confidently understands the different types of validation data (e.g., in-sample vs. out-of-sample and same period vs. next periods) and splits the data into estimation and validation datasets in a statistically sound method.	Sufficiently understands the differences in estimation and validation samples and splits the data into estimation and validation datasets, with acceptable levels of understanding different types of validation and sampling skills.	Explicitly splits the data into estimation and validation datasets, but does not show confidence in understanding the validation types and sampling skills.	Attempts to use the dataset without distinguishing estimation and validation datasets.

ELO 6. Storytelling: The ability to interpret model outputs, develop managerial and technical implications, and express oneself clearly, accurately, and professionally in both oral and written form

	Target **4**	**Competent** **3**	**Basic** **2**	**Unsatisfactory** **1**
Managerial Implications *Ability to develop managerial implications based on analysis results*	Meaningfully synthesizes connections between business problems and analysis results, and develops essential managerial implications.	Explicitly connects analysis results and business problems and develops proper managerial implications.	Connects analysis results and business problems in a basic way and develops partially relevant managerial implications.	Identifies minimal connections between analysis results and business problems, and develops broad managerial implications.
Writing Skills *Ability to clearly present the managerial problems and analysis-based solutions in the report*	Demonstrates a thorough understanding of business problems under investigation and solutions based on analysis results, and logically organizes the contents, using graceful language with clarity and fluency.	Demonstrates an adequate understanding of business problems and provides solutions appropriately based on analysis results, with straightforward contents, flow, and language.	Demonstrates a partial understanding of business problems and suggests some solutions based on analysis results, with some flaws in logic and grammar.	Attempts to provide simple solutions not relevant to business problems and not based on analysis, and demonstrates minimal attention to content flow and grammar.
Oral Communication Skills *Ability to communicate central messages with the business client professionally in presentation*	Precisely and confidently states central messages, well organized and strongly supported by analysis results using effective language choices and compelling delivery techniques (e.g., posture, gesture, eye contact, and vocal expressiveness).	Clearly and consistently states central messages appropriately organized and supported by analysis results using thoughtful language choices and delivery techniques.	Adequately states central messages that are understandable and partially supported by analysis results, but effective organization, language choices, and delivery techniques are intermittently observable.	Inexplicitly states central messages, minimally organized and not analytically supported, using unclear language choices and poor delivery techniques.

Appendix B. Student Exit Survey

Kansas State University
Master of Science in Data Analytics Program
M.S. Students' Exit Assessment Form
(Assessment is conducted after completion of the degree by the student)

Student Name (Optional): _____
Date: _____

Please indicate the extent to which you agree or disagree with the following statements, based on your graduate program education experiences at KSU on completion of the degree.

Student Learning Outcome **I obtained the ability to...**	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
1. Understand client's business problems and analytics project requirements					
2. Demonstrate advanced skills of data collection from various sources (e.g., websites, social media, corporate databases)					
3. Prepare the data for analysis					
4. Apply various methodologies (e.g., regression, clustering) and develop appropriate models, based on business problems and data types					
5. Evaluate and validate the models					
6. Interpret analysis results and communicate the managerial implications professionally					
Overall, I am satisfied with the master program					

Please tell us about your demographic information.

(1) What is your gender? Male ( ) Female ( )

(2) What is your nationality? American ( ) International ( )

(3) What was your undergraduate major?

(4) What track did you pursue? Data science ( ) Applied analytics ( )

(5) What year and semester did you join the program? Year: _____, Semester: _____

Additional Comments:

Thank you for your participation.

CURRICULUM OUTLINE
NEW DEGREE PROPOSALS
Kansas Board of Regents

I. Identify the new degree:

Master of Science in Data Analytics

II. Provide courses required for each student in the major:

Course Name & Number		**Cr. Hours**
Core Courses		
CIS 798/731:	Programming Techniques for Data Science & Analytics (F)	3 hrs
ECON 630	Intro to Econometrics (F,S)	3 hrs
IMSE 785:	Big Data Analytics (S)	3 hrs
MANGT 830:	Information Technology Strategy and Application (F)	3 hrs
MIS 665:	Business Analytics and Data Mining (F,S)	3 hrs
MIS 670:	Social Media Analytics and Web Mining (F,S)	3 hrs
MKTG 880:	Applied Marketing Analytics (S)	3 hrs

Total Hours of Core Courses: 21

Electives: *Choose three (3) from one of the two following tracks:*

Track #1: Data Science

CIS 730:	Principles of Artificial Intelligence (3 hrs) (S)
CIS 732:	Machine Learning and Pattern Recognition (3 hrs) (F,S)
CIS 751:	Computer and Information Security (3 hrs) (F)
CIS 833:	Information Retrieval and Text Mining (3 hrs) (F)
MATH 725:	The Mathematics of Data and Network I (3 hrs) (F)
MATH 726:	The Mathematics of Data and Network II (3 hrs) (S)
STAT 717:	Categorical Data Analytics (3 hrs) (S)
STAT 730:	Multivariate Statistical Methods (3 hrs) (S)

Track #2: Applied Analytics

ACCTG 856:	Accounting Analytics (3 hrs) (S,Su)
CIS 732:	Machine Learning and Pattern Recognition (3 hrs) (F,S)
ECON 686:	Economic Forecasting (3 hrs) (F,S)
FINAN 623:	Financial Modeling (3 hrs) (F,S)
GEOG 608:	Geographic Information Systems II (3 hrs) (F)
GEOG 712:	Internet GIS and Distributed Geographic Information Services (3 hrs) (S)
GEOG 728:	Topics in Programming for Geographic Analysis (3 hrs) (F,S)
GEOG 808:	Geocomputation (3 hrs) (S)
MANGT 662:	Procurement, Logistics and Supply Chain Design (3 hrs) (S)
MKTG 881:	Advanced Marketing Analytics (3 hrs) (F)

Total Hours Electives 9

Research n/a

Practica n/a

Total Hours 30

IMPLEMENTATION YEAR FY 2019-2020

Fiscal Summary for Proposed Academic Programs

Institution: Kansas State University **Proposed Program: Master of Science in Data Analytics**

Part I. Anticipated Enrollment	Implementation Year		Year 2		Year 3	
	Full-Time	Part-Time	Full-Time	Part-Time	Full-Time	Part-Time
A. Full-time, Part-time Headcount:	3	2	10	5	20	5
B. Total SCH taken by all students in program	75 (=3*21 + 2*6)		240 (=10*21 + 5*6)		450 (=20*21 + 5*6)	

Part II. Program Cost Projection

A. In implementation year one, list all identifiable General Use costs to the academic unit(s) and how they will be funded. In subsequent years, please include only the additional amount budgeted.

	Implementation Year	Year 2	Year 3
Base Budget Salaries	$19,589.06	0	0
OOE	0	0	0
Total	$19,589.06	0	0

***Salary Breakdown (Core course faculty)**

Faculty	Salary from General Use Funds (A)	Teaching % (B)	General Use Funds for Teaching (A*B)	Teaching % to support new MS-DA (C)	General Use Funds for Teaching to support new Sales Major (A*B*C)
William. Hsu	$108057	50	$54028.5	6.25	$3376.781
Yoon-Jin. Lee	116150	40	46460.0	6.25	2903.750
Shing I Chang	90496	40	36198.4	6.25	2262.400
Roger McHaney	150818	45	67868.1	6.25	4241.756
Bongsug Chae	138328	40	55331.2	6.25	3458.200
Jaebeom Suh	118975	45	53538.75	6.25	3346.172
Total					**$19589.059**

Notes:

- No new courses are offered; no new faculty lines are required.
- Teaching % to support the new MS-DA program is determined based on the following assumptions:
  a. All core faculty members teach two courses per semester or four courses per year. The average enrollment per course is 40 students, and the average number of students each faculty member teaches per year = 40 x 4 courses = 160 students
  b. An average of 10 students have enrolled annually for the new MS-DA, for the first two years, FY2019-2020.
  c. The teaching % to support the new MS-DA program = 10 students / (40 students x 4 courses) = 0625.

Indicate source and amount of funds if other than internal reallocation: n/a.

Revised: September, 2003

Approved: _____