

**KANSAS BOARD OF REGENTS
COUNCIL OF CHIEF ACADEMIC OFFICERS**

VIDEO CONFERENCE AGENDA

October 7, 2020

11:30 a.m – 12:00 p.m.

The Council of Chief Academic Officers (COCAO) will meet by video conference. The public is welcome to listen to the meeting in Suite 520, Curtis State Office Building, located at 1000 SW Jackson, Topeka, KS 66612. Questions can be emailed to arobinson@ksbor.org.

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|---|--------------------------------|-------|
| I. Call to Order | Rick Muma, Chair | |
| A. Roll Call | | |
| B. Approve Minutes from the September 8, 2020 | | p. 3 |
| II. Requests | | |
| A. First Readings | | |
| 1. Bachelor of Arts in Applied Linguistics – WSU | Rick Muma | p. 6 |
| 2. Master of Science in Data Science in Engineering – WSU | Rick Muma | p. 19 |
| 3. Master of Science in Business Analytics – WSU | Rick Muma | p. 29 |
| 4. Master of Science in Mathematical Foundations of Data Analysis – WSU | Rick Muma | p. 40 |
| B. Second Readings | | |
| 1. Master of Engineering in Bioengineering – KU | Barbara Bichelmeyer | p. 47 |
| C. Other Requests | | |
| 1. Act on Request for Approval of Name Change of Institute for Interdisciplinary Innovation to the College of Innovation and Design – WSU | Rick Muma | p. 65 |
| III. Council of Faculty Senate Presidents Update | Aleksander Sternfeld-Dunn, WSU | |
| IV. Other Matters | | |
| A. Creating a Center for Professional Selling – PSU | Howard Smith | p. 66 |
| B. Lumina Military Grant Update | Connie Beene, KBOR | p. 67 |
| C. Discuss Opportunities (new degree programs, partnerships, strategic initiatives, etc.) that Universities are Considering or Planning to Pursue in the Future | COCAO Members | |
| V. Next COCAO Meeting – November 18, 2020 | | |
| VI. Adjournment | | |
| The University Press of Kansas Board of Trustees will meet upon adjournment via a separate video conference. | | |

COUNCIL OF CHIEF ACADEMIC OFFICERS

The Council of Chief Academic Officers, established in 1969, is composed of the academic vice presidents of the state universities. The Board's Vice President for Academic Affairs serves as an ex officio member, and the member from the same institution as the chairperson of the Council of Presidents serves as chairperson of the Council of Chief Academic Officers. The chief academic officers of the University of Kansas Medical Center and Washburn University are authorized to participate as non-voting members when agenda items affecting those institutions are to be considered. The Council of Chief Academic Officers meets monthly and reports to the Council of Presidents. The Council of Chief Academic Officers works with the Board Academic Affairs Committee through the Vice President for Academic Affairs. Membership includes:

Rick Muma, Chair	WSU	Barbara Bichelmeyer	KU
Jill Arensdorf	FHSU	Robert Klein	KUMC
David Cordle	ESU	JuliAnn Mazachek	Washburn
Howard Smith	PSU	Daniel Archer	KBOR
Charles Taber	K-State		

Council of Chief Academic Officers AY 2020 Meeting Schedule

Meeting Dates	Location	Lunch Rotation	Institution Materials Due	New Program Requests due
September 08, 2020 <small>*10:45am or upon adjournment of SCOCAO</small>	Video Conference		August 19, 2020	July 14, 2020
October 07, 2020 <small>*11:30am, UPK after</small>	<i>Conference Call for degree programs only</i>			August 12, 2020
November 18, 2020	Topeka *Previously at ESU		October 28, 2020	September 23, 2020
December 16, 2020	Topeka		November 24, 2020	October 21, 2020
January 20, 2021	Topeka		December 30, 2020	November 18, 2020
February 17, 2021	Topeka		January 27, 2021	December 23, 2020
March 17, 2021	Topeka		February 24, 2021	January 20, 2021
April 14, 2021	FHSU	FHSU	March 24, 2021	February 24, 2021
May 19, 2021	Topeka		April 28, 2021	March 24, 2021
June 16, 2021	Topeka		May 26, 2021	April 21, 2021

**Council of Chief Academic Officers
MINUTES**

Tuesday, September 8th, 2020

The September 8, 2020 meeting of the Council of Chief Academic Officers was called to order by Chair Rick Muma at 10:40 a.m. The meeting was held through Zoom. Members and the public were welcome to listen at the KBOR offices.

In Attendance:

Members:	Rick Muma, WSU	Jill Arensdorf, FHSU	Robert Klein, KUMC
	Charles Taber, K-State	David Cordle, ESU	JuliAnn Mazachek, Washburn
	Barbara Bichelmeyer, KU	Howard Smith, PSU	Daniel Archer, KBOR
Staff:	Sam Christy-Dangermond	Amy Robinson	Cindy Farrier
	Karla Wiscombe	Tara Lebar	
Others:	Brad Bennett, Colby CC	Jean Redeker, KU	Brian Niehoff, K-State
	Jason Sharp, Labette CC	Lua Yuille, KU	Mark Allen, Independence CC
	Sandy Valenti, ESU	Mickey McCloud, JCCC	Monette Depew, Pratt CC
	Linnea GlenMaye, WSU	Michelle Schoon, Cowley CC	Brenton Phillips, Cloud County CC
	Cindy Hoss, Hutchinson CC	Jane Holwerda, Dodge City CC	Jon Marshall, Allen County CC
	Haley Reiter, FHSU	Aleks Sternfeld-Dunn, WSU	Aron Potter, Coffeyville CC
	Scott Lucas, WSU Tech	Tonya Ricklefs, Washburn	Lori Winningham, Butler CC
	Jerry Pope, KCKCC	Jennifer Ball, Washburn	Luke Dowell, Seward County CC
	Heather Morgan, KACCT		

Rick Muma welcomed everyone, and roll call was taken.

Approval of Minutes

Chuck Taber moved to approve the minutes of the June 17, 2020 meeting, and Jill Arensdorf seconded the motion. With no corrections or discussion, the motion passed.

1st Readings

- KU is requesting a Master of Engineering in Bioengineering. Barbara Bichelmeyer stated this new degree is the same as the MS in Bioengineering but does not require a thesis. Jean Redeker added that there is strong enrollment in the current degree, and the new program will substitute course work for the thesis. Barbara noted the change is being driven by student requests.

No action is required for first readings. This program will be presented for a vote at the next COCAO meeting.

2nd Readings

- KU is requesting a Bachelor of Health Sciences in the School of Professional Studies at the Edwards Campus. This is an online completion degree and collaborated between KUMC and JCCC. Rick noted that at the first reading there were questions whether this degree could or would be offered virtually and asked Barbara Bichelmeyer for a follow up. Barbara responded that there will be courses in the program that will be offered virtually. She noted that this degree connects with programing at KUMC. She noted there is great demand in the region. David Cordle asked if the BHS was a common degree designation. Barbara responded that it matched with the CIP Code in the standard index, and because it ties into the School of Professional Studies and links them with KUMC, it seemed an appropriate name for the

program. Committee members discussed that this degree is common and used in other institutions such as at Washburn University. Committee members posed no further questions.

Jill Arensdorf motioned to approve the Bachelor of Health Sciences, and Chuck Taber seconded the motion. The motion passed unanimously. Rick noted this proposal will be forwarded to COPS for approval.

- K-State is requesting a Bachelor of Science and Bachelor of Arts in Integrated Computer Science in the College of Arts and Sciences. This program will combine computational skills with any thematic area across the university. No questions were presented by the Committee since the first reading.

David Cordle motioned to approve the Bachelor of Science and Bachelor of Arts in Integrated Computer Science, and Jill Arensdorf seconded the motion. The motion passed unanimously. Rick noted this proposal will be forwarded to COPS for approval.

- K-State is requesting a Bachelor of Science in Public Health in the College of Health and Human Sciences/Kinesiology. Chuck Taber stated he has not received any questions or comments since the first reading.

Barbara Bichelmeyer motioned to approve the Bachelor of Science in Public Health, and Howard Smith seconded the motion. The motion passed unanimously. Rick noted this proposal will be forwarded to COPS for approval.

Council of Faculty Senate Presidents Update

Aleksander Sternfeld-Dunn, WSU Faculty Senate President, provided an update. Aleks stated the first COFSP meeting won't be until the following day. He stated in the first meeting the Council will work on plans to craft a freedom of speech policy at a regents level at the request of KBOR CEO Blake Flanders which could be disseminated to universities to build from. He noted that COFSP worked on this last year and were unable to pass a policy, but this year they believe there is legislative interest and he would like to have something in place before any legislative action would commence. Aleks stated the Council will also be discussing the General Education package and Associate to Bachelor degree transfer issue that the Board will be looking at, and more specifically, crafting a statement of support or non-support.

Other Matters

- Rick Muma noted the University Press of Kansas Board of Trustees will need to meet after adjournment of COCAO to discuss time-sensitive matters. Members had no objections to meeting upon adjournment.
- Sam Christy-Dangermond provided information on updating university admissions policies. The proposed changes to Qualified Admissions came about from a 2018 Board Goal to simplify the admissions process with a focus on a pre-college curriculum. The Board is anticipated to approve the changes at their next meeting, as outlined in the provided materials. As such, state universities will need to update their admissions policies. KAR 88-29c-9 requires universities to establish admissions policies that meet specific requirements and that these be approved by the Board. Sam requested that each institution submit an updated admissions policy to KBOR Academic Affairs. She proposed the due date of December 11, 2020 and asked if any members had feedback on this possible date. The Committee agreed that this date was acceptable. Sam noted that universities can submit their updated policies to her, Amy, or Daniel.
- Daniel Archer provided recommendations for identifying high school courses for college preparation. Daniel noted that the Board approved changes to admission criteria last year, and one of the most

significant is specific high school courses will no longer be required for explicit condition of admission. He noted that this means units rather than specific courses will be recommended to encourage preparation. Over the last several months, KBOR has received feedback from several K-12 entities indicating it would be helpful for KBOR to recommend some specific courses. KBOR is recommending COCAO endorse the Kansas Scholars Curriculum to be used as the recommended course work rather than going with general units. These courses are required in secondary education to be eligible for state funded scholarships and noted this also makes sense due to the familiarity with the curriculum, and it will help guide more students to a path towards higher education. He noted this is only a recommendation, and therefore will not be regulated or reviewed by the universities. Jill Arensdorf asked for clarification if courses are required to be taken within only the high school years. Daniel responded that the Kansas Scholars Curriculum is framed as such that students are allowed to use courses taken from grades 8-12.

David Cordle motioned to approve the Kansas Scholars Curriculum as the recommended courses for qualified admission, and Howard Smith seconded the motion. With no further questions or discussion, the motion passed.

- Daniel Archer discussed future collaborations with Chief Diversity Officers in addressing graduation equity gaps. Addressing these gaps is one of the biggest components in the new strategic plan passed by the Board in June. Going forward, he anticipates a Board Goal to work with Chief Diversity Officers and entities at the 2-year institutions to identify best practices which may be scalable across the state and implemented individually to address the gaps. Daniel noted the Chief Diversity Officers meet weekly and they will provide updates at future SCOCAO meetings to ensure everyone is on the same page moving forward and everyone is aware of actions taken and any impacts that may result.

Future University Opportunities and Plans

- Howard Smith noted the PSU College of Business is working on a Center for Professional Sales. He noted that they have some alumni that would like more work in that area and they also have a certificate in the area. PSU is currently putting together a proposal for the center.
- David Cordle stated ESU has a group of faculty drafting a proposal for a new Master in Applied Sociology. David noted that what has been drafted so far indicated no other Master's programs in the system in Sociology have the applied focus that this program will consist of.
- Barbara Bichelmeyer stated KU is working on a Doctorate of Social Welfare.

Adjournment

Barbara Bichelmeyer moved to adjourn the meeting, and Jill Arensdorf seconded the motion. With no further discussion, the motion passed. The meeting adjourned at 11:11 a.m.

Program Approval

Summary

Universities may apply for approval of new academic programs following the guidelines in the Kansas Board of Regents Policy Manual. Wichita State University has submitted an application for approval and the proposing academic unit has responded to all of the requirements of the program approval process.

October 7, 2020

I. General Information

A. Institution

Wichita State University

B. Program Identification

Degree Level: Bachelor's degree
Program Title: Applied Linguistics
Degree to be Offered: Bachelor of Arts
Responsible Department or Unit: Liberal Arts and Sciences/Department of English
CIP Code: 16.0105
Modality: Face-to-Face
Proposed Implementation Date: Spring 2021

Total Number of Semester Credit Hours for the Degree: 120

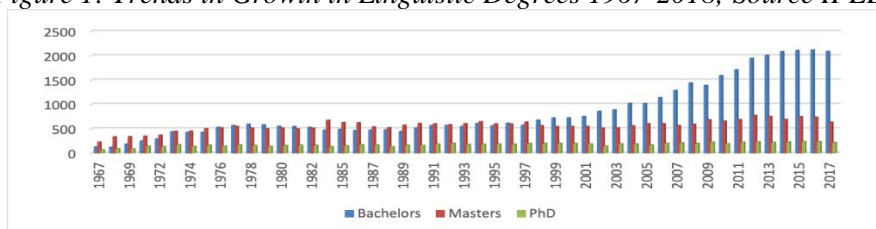
II. Clinical Sites: Does this program require the use of Clinical Sites? No

III. Justification

The proposed BA degree in Applied Linguistics arises out of a student need for an option to major in linguistics and it is intended as an interdisciplinary major for a diverse student population. Linguistics, as an academic field, has seen tremendous growth in the last 70 years and it is currently at the forefront of interdisciplinary research in artificial intelligence, data science, computer science, speech pathology, natural language processing, and marketing and branding strategies. The BA program of study is designed to be flexible, to accommodate multiple content concentrations while providing enhanced academic training and the highest quality of applied learning experience. Connected to this is WSU's recent investment in a High-Performance Computing (HPC) infrastructure and personnel to provide an arena for applied learning and research in large data sets of natural language corpora. The BA program will enable undergraduate students to specialize in a subfield of linguistics and offer them the skill sets needed to pursue graduate school and doctorate programs, or find job placements in the industry.

Linguistics is particularly appealing to underserved student populations as more and more Native American languages are being revitalized and studied under several sub-fields of linguistics. In addition, linguistics is a new and emerging academic program that could lead to potential growth in enrollment at Wichita State. There are several summer schools targeting Native American populations and other minority groups. Advertising the new BA in Applied Linguistics at these venues could lead to increased enrollment. Linguistics plays a vital role in community engagement. Several linguistics classes taught at Wichita State currently include a service to the community component. This aligns with Wichita State's applied learning mission. In the last decade or so, the undergraduate linguistics degree production in linguistics has seen the fastest growth in universities.

Figure 1: Trends in Growth in Linguistic Degrees 1967-2018; Source IPEDS



In addition, a linguistics degree comes with several research opportunities. The National Science Foundation classifies linguistics under social sciences and has funded many research projects in linguistics over the past years. Students pursuing an applied linguistics major can pursue paid internships in research labs across the country. The introduction of an applied linguistics major provides an opportunity for Wichita State to place itself on the national map of linguistics research. It will broaden Wichita State’s ability to become an educational, cultural, and economic driver in the region.

The proposed major builds on an existing linguistics minor. This minor is an interdisciplinary area of study, with courses being taught across two colleges, College of Liberal Arts and Sciences and College of Health Professions. The major requires no additional courses and little to no additional funding to implement. The required courses for the major are already being taught on a regular rotation basis, and the resources needed to support administrative tasks are available.

The BA degree program will be housed in the English department with three interdisciplinary concentrations, as listed below:

Proposed: Bachelor of Arts in Applied Linguistics

- General linguistics concentration
- Speech pathology and communication sciences concentration
- Computer science and data science concentration

IV. Program Demand:

The only university in Kansas that has an active linguistics program is the University of Kansas, which has a Department of Linguistics offering a BA in Linguistics, MA in Linguistics, and a PhD in Linguistics. Emporia State University, Fort Hays State University, Pittsburg State University, and Kansas State University offer neither a linguistics minor nor a major. Kansas State University offers a certificate in Linguistics. The new BA degree program at Wichita State builds on a thriving linguistics minor. Currently, there have been 30 students enrolled in the minor since Fall 2016, when the minor was officially revived. Wichita State is suitably placed to serve under-represented minorities and low-income populations in Southern Kansas who may be interested in majoring in linguistics and cannot afford to relocate to Lawrence, KS or out of state.

A. Survey of Student Interest: Including Past and Current Students

Number of surveys administered:	70
Number of completed surveys returned:	48
Percentage of students interested in program: ...	73%

Results of a survey from 48 current students at Wichita State and recent graduates provides descriptive information regarding the need of a BA degree. Thirty-six percent of the respondents were in their senior year. Out of the 48 respondents, ninety-six percent of them had taken a linguistics class at Wichita State and ninety-four percent will

recommend linguistics classes to their friends. Ninety-six percent of them responded they thought the new linguistics major will benefit the student population at Wichita State. Seventy-two percent of the respondents would consider majoring in linguistics if the major was available in their freshman year and seventy-five percent will recommend the major to their friends.

Since Fall 2016, six linguistics minors have graduated from Wichita State and they have all expressed interest in pursuing an MA in linguistics or a doctoral program in linguistics. In addition, a graduate of the English program is currently pursuing a PhD in Hispanic Linguistics at another university, after defending an MA thesis in linguistics at Wichita State. Student comments in the survey clearly indicate that Wichita State has lost students to other universities due to the lack of the linguistics major.

B. Market Analysis

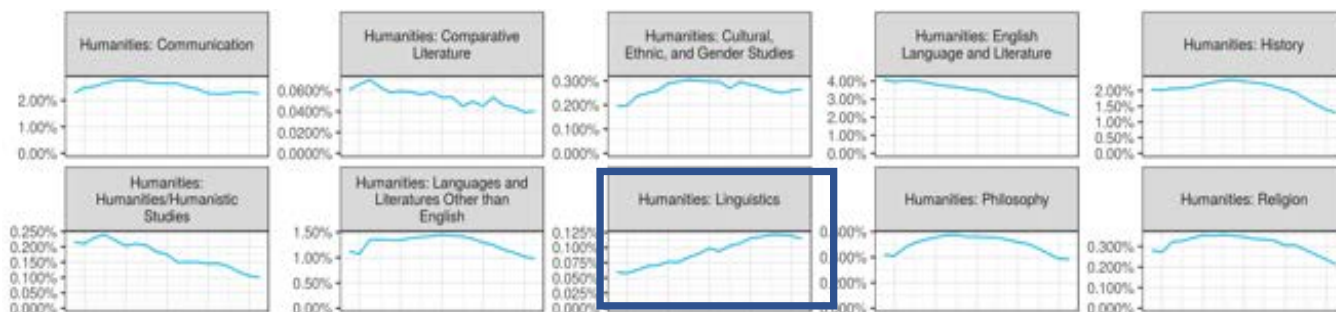
The Linguistics Society of America's 2016 Annual Report notes that the field of linguistics is growing most rapidly for undergraduates, with an increase of approximately 120 more students awarded BA degrees annually for the past 14 years. Most of these linguistics undergraduate degrees are awarded to women. Although women represent over half of graduate students in linguistics, a number which has been increasing over the last 50 years, women comprise 57 percent of the undergraduate population, surpassing the amount of male undergraduate recipients. The major is appealing to diverse sets of population, including Hispanic, Asian, African American, American Indian ethnicities. In addition, in a recent article, Schmidt (2018) writing about the decline of majors in humanities, says "The only bright spot is linguistics, the rare field that bridges the humanities and the sciences directly." This is motivated by the fact that linguistics is the sole field in the humanities that has shown an upward trajectory in terms of enrollment for Bachelors (see, Figure 2 below).

Linguists have played key parts in strides made in automated speech recognition, worked to improve dictionaries in mobile phones, and played a huge part in preserving and protecting endangered languages. Adzuna, a UK based recruitment platform, placed linguistics in the top 5 best career prospects with over 9,000 job vacancies. In addition, the International Linguistics Olympiad, annually held since 2003, is one of 12 International Science Olympiads for secondary school students. If brought to Wichita, this would be a good strategy to recruit students from schools in and around the Wichita school district. Many students would be compelled to join WSU and pursue linguistics, if they see the appeal and the lucrative career options the major offers.

Linguistics fits right in with the innovation campus mission of WSU. In a recently concluded Applied Learning Showcase in November 2017, all of the 8 student presentations were from linguistics courses offered in English and Modern and Classical Languages and Literatures. Many students work in the community as translators, health care specialists, helping refugees resettle in Wichita, and working with community partners such as Lord's Diner and Kansas Food Bank to serve the homeless, thus spreading the message of public good and merging community with public impact.

Linguistics is also at the core of several interdisciplinary initiatives across the US. MIT recently announced funding for a \$1 billion backed college for artificial intelligence. Dr. Rafael Reif, the president, is quoted as saying the college is to "educate the bilinguals of the future." He defines bilinguals as "people in fields like biology, chemistry, politics, history and linguistics who are also skilled in the techniques of modern computing that can be applied to them" (Lohr, 2018).

Figure 2: Degree share of common majors over the last 35 years, Data from NCES IPEDS: Taxonomy building on American Academy of Arts and Sciences, Ben Schmidt, 2018.



When looking at degrees awarded for common majors, linguistics remains the sole major which has consistently seen an upward trajectory across the years. This is in part fueled by the increasing demand for linguists in the tech industry, working alongside computer engineers at Google, Facebook, Apple, Amazon and other companies.

V. Projected Enrollment for the Initial Three Years of the Program

Table 1. Projected Enrollment

Year	Headcount Per Year		Sem Credit Hrs Per Year	
	Full- Time	Part- Time	Full- Time	Part- Time
Implementation (AY 2020-2021)	15	0	450	0
Year 2 (AY 2021-2022)	20	0	1080	0
Year 3 (AY 2022-2023)	20	0	1660	0

VI. Employment

An applied linguistics major is vital to the current trends in employment opportunities. A recent study by Deming (2017) found that jobs requiring both soft skills and thinking skills have seen the largest growth in employment and pay in the last three decades. An interdisciplinary curriculum offered in linguistics provides Wichita State students with both sets of skills. Graduates of the BA degree program work in jobs as diverse as sales, finance, and market research because linguistics combines critical thinking with computational and statistical skills. Along with quantitative skills, and data visualization, the applied linguistics major will also teach students the role of ethics in social media, attitudes towards immigrants and languages in the US, the role of linguistics in providing quality healthcare, and equip them with skills required to solve several problems and challenges at these interfaces.

The interdisciplinary curriculum of this program offers excellent training for a wide variety of careers, including translation, interpreting, teaching, publishing, national security, international affairs, forensics, or medicine, and for graduate study in linguistics or related fields (such as anthropology, law, philosophy, psychology, cognitive science, neuroscience, computer science, or speech and hearing sciences). The proposed applied linguistics program encourages applied learning and service learning. These skill sets can land students in lucrative career options. The innovative nature of the program and its application with computer science, communication sciences, and psychology can lead to increased job opportunities in the tech industry, where linguists work with virtual voice assistants such as, *Alexa*, *Siri*, and dictionary and Adwords projects with *Google*. Students will be encouraged to learn coding and use python for small scale research projects. Creating capstone research opportunities will make students better suited for graduate academic positions, as well as industry positions. In addition, linguistics can easily integrate other innovative certificates and badge courses in Digital Humanities, Food Studies, Big Data, Latinx, and STEM initiatives, as well as prepare educators to work with immigrant and

language minority children.

Figure 3: Searches for positions titled “linguistics” yields the following numbers of job listings

Website for job listings	Number of linguistics jobs listed
Glassdoor	9,323
Ziprecruiter	5,860
Indeed	5,055
SimplyHired	3,561
LinkedIn	3,000
HigherEdJobs	642
InsideHigherEd	439

A search conducted on various job posting websites for “linguistics” jobs yields several job results, suggesting linguists are in high demand across the nation. These job listings include positions in the industry, both private and public, as well as jobs in higher education. In addition, the U.S Bureau of Labor Statistics has projected a job growth of 11% between 2018-2028, which is faster than average. Median salary for linguists’ jobs is \$81,340.

Sample Careers after a B.A. in Applied Linguistics

- Receive a B.A. in Applied Linguistics and teach English in a foreign country. Many students pursue teaching in countries such as Spain, China, Korea, Russia or Japan.
- Receive a B.A. in Applied Linguistics, coupled with excellent multilingual skills, and work as an interpreter. For example, interpreters of American Sign Language are in demand in many places in the U.S.
- Receive a B.A. in Applied Linguistics, coupled with a concentration of courses in computer science, and obtain positions in technology companies creating computers that can comprehend and produce human languages. For example, many new search engines work on the basis of natural languages. In recent years, the demand for people with such backgrounds has exploded, and linguists are in high demand. With *Siri*, *Alexa*, and *Cortana* leading the way to a new age in artificial intelligence, the intersection of linguistics and computer science is a very lucrative one.

PROFESSIONS

- academic
- broadcaster
- community service language policy adviser
- editor or publisher
- government and non-government professional roles
- journalist
- language policy, logistics or management roles
- language researcher
- policy researcher/adviser
- TESOL practitioner
- interpreter/translator

EMPLOYERS

- An international career in language related areas
- Education
- Government departments concerned with immigrants and language policy

- Non-government organizations and community service providers
- Speech technology research companies
- NSA and FBI

VII. Admission and Curriculum

A. Admission Criteria

If you are a freshman Kansas resident (under 21 years of age) graduating in 2015 or later, you must:

1. Achieve an ACT composite score of 21 or above OR a minimum combined SAT-I score of 1080, **OR**
2. Rank in the top 1/3 of your high schools' graduating class, **AND**
3. Complete the [Kansas Qualified Admissions Pre-College Curriculum](#) with at least a 2.00 grade point average (GPA) on a 4.00 scale. **Out-of-state residents** must earn a 2.50 or higher GPA on a 4.00 scale.

If you graduated from a non-accredited high school or were homeschooled, you must:

Complete coursework equivalent to the [Kansas Qualified Admissions Pre-College Curriculum](#) with a 2.00 GPA and achieve an ACT score of 21 or above or a combined SAT-I score of at least 980. If you enroll in college courses while in high school, you must achieve a 2.00 GPA or higher in those courses.

B. Curriculum

120 hours are required for graduation, and students must earn a 2.0 overall GPA, a 2.0 Wichita State GPA, and a 3.0 GPA in the major. Students must also complete all courses required for Liberal Arts and Sciences General Education. In addition, Foreign Language courses (or the equivalents) are required for every BA degree in the College of Liberal Arts and Sciences.

Curriculum in the first year is the same for all three concentrations.

Year 1: Fall

SCH = Semester Credit Hours

Course #	Course Name	SCH....
ENGL 101	College English I	3
COMM 111	Public Speaking	3
MATH 111	College Algebra	3
FYS 102d	Cross Cultural Communication	3
	Any humanities general education course	3

Year 1: Spring

Course #	Course Name	SCH....
ENGL 102	College English II	3
	Any social sciences general education course	3
	Any natural sciences general education course	3
	General education elective 1 st of 3	3
LING 151	The Nature of Language	3

Curriculum varies for each of the three concentrations in years two through five.

1. Plan of study for the General Linguistics concentration

Year 2: Fall

Course #	Course Name	SCH....
	Any fine arts general education	3
	General education elective 2 nd of 3	3
LING 152	The Language of Food	3

LING 315	Introduction to English Linguistics	3
	Free elective 1	3

Year 2: Spring

Course #	Course Name	SCH....
LING 304	Early Language Development	3
LING 317	History of the English Language	3
LING 270	American Sign Language	3
	Foreign Language I	5
	General Education elective 3 rd of 3	3

Year 3: Fall

Course #	Course Name	SCH....
LING 351	Linguistics and Foreign Language or LING 352 Anthropological Linguistics	3
PHIL 325	Formal Logic	3
	Foreign Language 2	5
	Free elective 2	3

Year 3: Spring

Course #	Course Name	SCH....
LING 306	Applied Phonetics	3
LING 667	Languages and Language Attitudes in the US	3
	Free elective 3	3
	Foreign Language 3	5

Year 4: Fall

Course #	Course Name	SCH....
	Free elective 4	3
	Free elective 5	3
	Free elective 6	3
	Free elective 7	3
LASI 481	Internship introduction	3

Year 4: Spring

Course #	Course Name	SCH....
LING 506	Acoustic and Perceptual Phonetics	3
LING 668	Field Methods in Linguistics	3
LING 481	Linguistics Capstone course	3
	Free elective 8	3
LASI 481	Internship	3

Total Number of Semester Credit Hours [120]

2. Plan of Study for the Speech Pathology and Communication Sciences Concentration (collaboration with the Department of Communication Sciences and Disorders, College of Health Sciences)

Year 2: Fall

Course #	Course Name	SCH....
	Any fine arts general education	3
	General education elective 2 nd of 3	3
CSD 251	Auditory Development and Disorders	3
LING 315	Introduction to English Linguistics	3
	Free elective 1	3

Year 2: Spring

Course #	Course Name	SCH....
LING 304	Early Language Development	3
LING 306/306L	Applied Phonetics and Lab	3
LING 270	American Sign Language	3
	Foreign Language I	5
	General Education elective 3 rd of 3	3

Year 3: Fall

Course #	Course Name	SCH....
CSD 301	Anatomy and Physiology of the Speech and Hearing Mechanisms	3
CSD 512	Communication in Special Populations: Children	3
	Foreign Language 2	5
	Free elective 2	3

Year 3: Spring

Course #	Course Name	SCH....
LING 506	Acoustic and Perceptual Phonetics	3
HS 570	Neuroscience for Health Professionals	3
	Free elective 3	3
	Foreign Language 3	5

Year 4: Fall

Course #	Course Name	SCH....
	Free elective 4	3
	Free elective 5	3
	Free elective 6	3
	Free elective 7	3
LASI 481	Internship introduction	3

Year 4: Spring

Course #	Course Name	SCH....
HS 571	Neuroscience for Health Professionals	3
HS 572	Neuroscience for Health Professionals	3
LING 481	Linguistics Capstone course	3
	Free elective 8	3
LASI 481	Internship	3

Total Number of Semester Credit Hours [120]

3. Plan of Study for the Computer Science and Data Science Concentration (in collaboration with the Department of Electrical Engineering and Computer Science, College of Engineering)

Year 2: Fall

Course #	Course Name	SCH....
	Any fine arts general education	3
	General education elective 2 nd of 3	3
CS 211	Introduction to Programming	3
STAT 370	Elementary Statistics	3
	Free elective 1	3

Year 2: Spring

Course #	Course Name	SCH....
CS 311	Object-Oriented Programming	3
LING 315	Introduction to English Linguistics	3
LING 270	American Sign Language	3
	Foreign Language I	5
	General Education elective 3 rd of 3	3

Year 3: Fall

Course #	Course Name	SCH....
MATH 321	Discrete Mathematics I	3
MATH 322	Discrete Mathematics II	3
	Foreign Language 2	5
	Free elective 2	3

Year 3: Spring

Course #	Course Name	SCH....
PHIL 325	Formal Logic	3
CS 400	Data Structures	3
	Free elective 3	3
	Foreign Language 3	5

Year 4: Fall

Course #	Course Name	SCH....
	Free elective 4	3
	Free elective 5	3
	Free elective 6	3
	Free elective 7	3
LASI 481	Internship introduction	3

Year 4: Spring

Course #	Course Name	SCH....
CS 410	Programming Paradigms	3
LING 664	Quantitative Methods to Humanities and Social Sciences	3
LING 481	Linguistics Capstone course	3
	Free elective 8	3
LASI 481	Internship	3

Total Number of Semester Credit Hours [120]

For each of the concentrations, students can take electives from the following courses:

Table 2 Electives

Course #	Course Name	SCH....
LING 316	English Sentence Structure	3
LING 318	Dialectology	3
LING 505A	Advanced French Phonetics and Diction	3
LING 505B	Russian Phonology	3
LING 505C	Spanish Phonetics	3
LING 546	Spanish Language Learning	3
LING 547	Spanish in the US	3
LING 635	Introduction to Romance Linguistics	3
LING 651	Language and Culture	3
LING 664	Quantitative Methods in Humanities and Social Sciences	3
LING 667	English Syntax	3
LING 672	Dialectology	3
LING 720	Seminar in Old English	3
LING 740	Graduate Studies in Linguistics	3
PSY 322	Cognitive Psychology	3
PSY 325	Developmental Psychology	3
PSY 405	Human Factors Psychology	3
COMM 360	Applied Communication Strategies	3
CS 211	Introduction to Programming	3
CS 510	Programming Language Concepts	3
CI 324	Linguistics for Elementary Teachers	3
CI 775	Applied Linguistics: ESL/Bilingual Teacher(s)	3

VIII. Core Faculty

Note: * Next to Faculty Name Denotes Director of the Program, if applicable

FTE: 1.0 FTE = Full-Time Equivalency Devoted to Program

Faculty Name	Rank	Highest Degree	Tenure Track Y/N	Academic Area of Specialization	FTE to Proposed Program
*Mythili Menon	Assistant Professor	PhD in Linguistics	Y	Syntax, Semantics, Morphology, Psycholinguistics, Language Documentation	1.0
Rachel Showstack	Associate Professor	PhD in Hispanic Linguistics	Y	Sociolinguistics	0.25
Douglas Parham	Associate Professor	PhD in Communication Sciences and Disorders	Y	Phonetics, Communication Sciences and Disorders	0.25

Jeffrey Hershfield	Professor	PhD in Philosophy	Y	Philosophy of Language, Formal Logic	0.25
Jens Kreinath	Associate Professor	PhD in Anthropology	Y	Anthropological Linguistics, Fieldwork	0.25
Andrew Hippisley	Professor and Dean of Liberal Arts and Sciences	PhD in Linguistics	Y	Computational Linguistics, Morphology, Syntax, Typology, Historical Linguistics	0.25
Francis Connor	Associate Professor	PhD in Literature	Y	Digital Humanities, Old English	0.25
New Hire in Linguistics (In Third FY)	Assistant Professor	PhD in Linguistics	Y	General Linguistics	1.0

Number of graduate assistants assigned to this program [0]

IX. Expenditure and Funding Sources (List amounts in dollars. Provide explanations as necessary.)

A. EXPENDITURES	First FY	Second FY	Third FY
Personnel – Reassigned or Existing Positions			
Faculty	193,684	196,590	199,538
Administrators (<i>other than instruction time</i>)	0	0	0
Graduate Assistants	0	0	0
Support Staff for Administration (<i>0.25 FTE reassigned</i>)	9750	9896	10,000
Fringe Benefits (<i>total for all groups</i>) (18.26%)	37,147	37,704	38,262
Other Personnel Costs	0	0	0
Total Existing Personnel Costs – Reassigned or Existing	\$240,581	\$244,190	\$247,800
Personnel – – New Positions			
Faculty	0	0	55,000
Administrators (<i>other than instruction time</i>)	0	0	0
Graduate Assistants	0	0	0
Support Staff for Administration (<i>e.g., secretarial</i>)	0	0	0
Fringe Benefits (<i>total for all groups</i>)	0	0	10,043
Other Personnel Costs	0	0	0
Total Existing Personnel Costs – New Positions			\$65,043
Start-up Costs - - One-Time Expenses			
Library/learning resources	0	0	0
Equipment/Technology	0	0	10,000
Physical Facilities: Construction or Renovation	0	0	0
Other	0	0	0

Total Start-up Costs			\$10,000
Operating Costs – Recurring Expenses			
Supplies/Expenses	0	0	0
Library/learning resources	0	0	0
Equipment/Technology	0	0	0
Travel (for recruitment purposes)	1,000	1,000	1,000
Other (Linguistics Club, Language & Linguistics Colloquium)			
Total Operating Costs	\$1,000	\$1,000	\$1,000
GRAND TOTAL COSTS	\$241,581	\$245,190	\$323,843

B. FUNDING SOURCES (projected as appropriate)	Current	First FY (15 New students)	Second FY (15 New students)	Third FY (20 New students)
Tuition / State Funds (credit hour fees total)	0	102,640.50	246,337.20	378,629.40
Student Fees	0	3,487.50	8,370.00	12,865.00
Other Sources (Per semester tuition)	0	20,375.40	47,542.60	74,709.80
GRAND TOTAL FUNDING	0	\$126,503.40	\$302,249.80	\$466,204.20
C. Projected Surplus/Deficit (+/-) (Grand Total Funding <i>minus</i> Grand Total Costs)		(\$115,077.60)	+\$57,059.80	+\$142,361.20

X. Expenditures and Funding Sources Explanations

A. Expenditures

Personnel – Reassigned or Existing Positions

Existing faculty teaching linguistics classes or in the linguistics program will continue to administer the program and teach the classes required for the degree program. Salary and fringes for the FTEs reassigned have been calculated and added to Section VIII Core Faculty. The program director, Mythili Menon, directs the linguistics minor and she is currently at 1.0 FTE in the linguistics track in the department.

Personnel – – New Positions

In the third year of implementation of the major, we plan to hire a new faculty in linguistics *with support of Academic Affairs*, to teach core courses in phonology, computational linguistics, and develop innovative courses to strengthen and build the linguistics program.

Start-up Costs – One-Time Expenses

Existing computers and desks can be used for faculty and instructors and therefore no new funding is requested.

Operating Costs – Recurring Expenses

A budget for travel related to recruitment has been allotted for the first three years of the implementation of the program.

B. Revenue: Funding Sources

Funding from tuition is based on \$228.09 per credit hour for full-time students. Funding from mandatory fees is based on \$7.75 per credit hour for full-time students. The per-semester mandatory student fee is \$679.18, and a total of \$1,358.36 per year. All the fees have been calculated for 15 new students in Year 1, 20 new students in Year 2 and 20 new students in Year 3 according to the credit hours taken per year.

C. Projected Surplus/Deficit

The program is profitable from Year 2 of implementation, bringing in a surplus revenue of \$57,059.80 in Year 2, and \$142,361.20 in Year 3, after the addition of the new faculty hire.

XI. References

1. Deming, D. (2017). "The Growing Importance of Social Skills in the Labor Market", *Quarterly Journal of Economics*. Volume 132, Issue 4, 1 November 2017, pp. 1593 -1640.
2. Lohr, S. (2018, Oct 15). MIT Plans College for Artificial Intelligence, Backed by \$1 Billion. Retrieved from <https://www.nytimes.com/2018/10/15/technology/mit-college-artificial-intelligence.html>.
3. Schmidt, Benjamin. "The Humanities are in Crisis." *The Atlantic*. August 23, 2018.
4. The State of Linguistics in Higher Education, Annual Report 2018, Sixth Edition, February 2019.

Program Approval

Summary

Universities may apply for approval of new academic programs following the guidelines in the Kansas Board of Regents Policy Manual. Wichita State University has submitted an application for approval and the proposing academic unit has responded to all of the requirements of the program approval process.

October 7, 2020

I. GENERAL INFORMATION

A. Institution Wichita State University

B. Program Identification

Degree Level:	Master's
Program Title:	Data Science
Degree to be Offered:	MS in Data Science
Responsible Department/Unit:	Electrical Engineering and Computer Science / College of Engineering
CIP Code:	30.7099
Modality:	Face-to-Face
Proposed Implementation Date:	Spring 2021

Total Number of Semester Credit Hours for the Degree: 30

II. CLINICAL SITES None

III. JUSTIFICATION

Data has been referred to as the “oil of the digital economy” due to its immense potential to optimal decision making (“The World’s Most,” 2017). **Data Science** (D.S.) deals with the generation of data, processing of it, and application and development of solutions using, but not limited to, machine learning, deep learning, and artificial intelligence. Big data is one of the most rapidly emerging topics in the world, creating a high demand for employees with expertise in various aspects of D.S. While this demand is global, due to the engineering and manufacturing nature of Wichita, it is especially important here.

Wichita State University (WSU) is strongly dedicated to supporting this data revolution by making teaching and research of data science and analytics an institutional priority. In support, WSU has recently invested in a High-Performance Computing (HPC) infrastructure and personnel. In this light, the MS in Data Science is one of the three distinct albeit aligned programs being proposed (the other two are in Business –MS in Business Analytics]; Liberal Arts and Sciences – MS in Mathematical Foundations of Data Analysis) to further this priority. All three share foundational coursework in business analytics, as well as other electives offered among the three colleges. The College of Engineering has elevated **computing and informatics** to a major priority and has made commitments for realigning and creating new programs in this field. In addition, WSU has chosen **Digital Transformation** as one of the pillars in *Convergent Sciences Initiative* and will be investing resources to help industry engage with academia in this space – data science is central to these efforts. Finally, the EECS Department has been allocated new resources to hire Dr. Dukka KC (director of the proposed program) as an Associate Professor to increase the D.S. capabilities at WSU and to create leadership potential in this space.

This proposed program offers students numerous opportunities to learn how to build a data pipeline and transform raw data in ways that provide end-users a competitive advantage. Starting with a broad survey of data science and analytics, the bulk of the program focuses on the algorithmic and computing aspects of D.S. The integrated curriculum includes a capstone project focused on hands-on/experiential learning. This proposed program clearly advances WSU’s mission to be an **essential educational, cultural, and economic driver for Kansas and the greater public good** by graduating students who are highly skilled in the sought-after field of data science.

Among public universities in Kansas, Kansas State University has an M.S. in Data Analytics program which is housed in College of Business and the University of Kansas has a M.S. in Applied Statistics and Analytics housed within the University of Kansas Medical Center. Although both of these programs help to fill some of the gap in the number of professionals with these skills, the available/unfilled D.S. related jobs are ever-increasing. In addition, the proposed program is unique as the focus is to develop data scientist and engineers who are well versed in algorithmic and computational thinking to develop data science related tools and infrastructure. Moreover, the majority of WSU students are from (or within 30 miles of) Wichita, thus locating a graduate program in Data Science at WSU provides the educational opportunity for students in the region.

IV. PROGRAM DEMAND

A. Survey of Student Interest

Number of surveys administered:	250
Number of completed surveys returned:	100
Percentage of students interested in program:	81%

The survey was sent to 250 undergraduate and graduate students in the Department of Electrical Engineering and Computer Science (EECS) at WSU to inquire about the need for a master’s degree in Data Science program. 57% percent of the respondents are undergraduate students while 43% are graduate students. Among these students, almost half (51%) were already taking some data science-related courses. Among the respondents, 91% saw significant value in a data science program at WSU. Similarly, 82% of the respondents said that they would consider enrolling in an M.S. D.S. program if it were offered. Finally, 87% of the respondents said that they would likely recommend this program to their friends.

B. Market Analysis

The *Harvard Business Review* calls data science the “**sexiest job of the 21st Century**” (Davenport & Patil, 2012). In addition, there is a significant demand for professionals with data science skills. Various reports and reviews have consistently pointed out the large gap in the number of professionals with these skills and available jobs in this area. Moreover, there has been a steady increase in the employment of data scientists, but demand is expected to grow even faster. According to Glassdoor, data scientist was the top job in America for the second year in a row in 2017 (Junco, 2017). In addition, Glassdoor cites that top among the benefits of a career in data science is a median base salary of \$110,000 and a knowledge base that is applicable to practically any field. This report also states that overall job satisfaction that comes with being a data scientist ranks 4.4 out of 5 dominating over several other highly-sought-after careers for the title of “best job.” The field of data science is experiencing rapid growth as new technology is developed and more data becomes available.

Data science growth is only expected to continue to develop and expand in the future. In fact, the Bureau of Labor Statistics (BLS), which reports employment data throughout the United States, has projected a 31% increase for statisticians and data scientists by the year 2026. BLS is not the only entity highlighting this as an essential current need. The same report from Glassdoor mentions that seven of the top ten spots are related to information technology (IT), and four are related to data management, including data engineer, analytics manager, database administrator, and mobile developer. In fact, recent data from job sites show that there has been a 29% increase

in demand for data scientists year after year and a 344% increase since 2013 (Flowers, 2019).

A recent report from the American Statistical Association (ASA) highlights the continued growth and demand for graduates with data science and analytical skills (2019). LinkedIn recently highlighted the fact that data science dominates the ranking of emerging jobs searched/available (Dignan, 2019). Of potential concern, searches by job seekers skilled in data science grew at a slower pace (14%), suggesting an increasing gap between supply and demand, which may be partially due to D.S. skills being typically acquired via an M.S. degree (Kolakowski, 2020). In response, D.S. M.S. programs are being developed rapidly across the country, and will soon become as critical as e.g., biology or psychology programs. Finally, the need is such, that a few of our own EECS graduates have already been hired as data analysts/scientists without having formal extensive education in data science. In sum, we are very excited about the job prospects for our future D.S. graduates.

V. PROJECTED NEW ENROLLMENT FOR INITIAL THREE YEARS OF PROGRAM

Year	Headcount Per Year		Semester Credit Hours Per Year	
	Full-Time	Part-Time	Full-Time	Part-Time
Implementation	15	0	270	0
Year 2	30	5	720	45
Year 3	30	5	900	90

VI. EMPLOYMENT

A Bureau of Labor Statistics (BLS) report, “Occupational Outlook Handbook, Mathematicians and Statisticians,” as well as other private sector reports, “Data Scientist: A Hot Job that Pays Well” (Flowers, 2019), and “New Report Highlights Growing Demand for Data Science, Analytics Talent, Steps for Higher Ed and Business Recommended” (ASA, 2019), clearly demonstrate the sharply increasing gap between the need for students with data science-related degrees and the supply of these students. In addition, the employment market for data scientists is robust, with a growing need for qualified data scientists/engineers. Through the aforementioned surveys and reports, it has also been well established that this need spans a variety of industries including technology, finance, telecommunications, manufacturing, service, retail, banking, cybersecurity, and others (Smith Hanley Associates LLC, 2018). Critically, the BLS also shows that Wichita, Kansas, is one of the metropolitan areas with a high demand for such jobs.

According to a recent jobs report by Glassdoor, based on the number of job openings, salary, and overall job satisfaction, data scientist is ranked number one, with more than 4,000 job openings; data engineer is ranked number three, with more than 2,500 job openings; and analytics manager is ranked number five, with almost 2,000 job openings (Junco, 2017). In addition, the number of data scientists has more than doubled over those five years, and the number of data engineers sextupled. Training in data science is relevant to many job titles, including statistician, computer systems analyst, software developer, database administrator, computer network analyst, data scientist, data analyst, data engineer, and data manager.

The proposed program with its state-of-the art curriculum and the inclusion of a real-world capstone will enable students to develop an array of competitive skills that will enable them to pursue a wide range of data science career paths. Some of the potential employment opportunities for graduates with a master’s in D.S. include data scientist, data engineer, business intelligence specialist, data analyst, and others.

VII. ADMISSION AND CURRICULUM

A. Admission Criteria

Students will be admitted in full graduate standing in the M.S. in Data Science program if they have a bachelor’s

degree in computer science or any related engineering discipline and a GPA of at least 3.00, and also meet the Graduate School's other requirements. Students who have a bachelor's degree in other quantitative disciplines (Mathematics, Physics, or other disciplines) with demonstrated quantitative skills (calculus, linear algebra, etc.) and proficiency in computer programming may be admitted on a conditional basis.

Application materials will be reviewed by the Graduate School and the Data Science graduate coordinator, after which the student will be notified of their decision. Students entering the M.S. in Data Science program are expected to have already completed courses in programming, linear algebra, statistics, and data structures. If prior coursework deficiencies exist, then the student may be admitted on a conditional basis. It is recommended that deficiencies are completed prior to beginning graduate studies.

B. Curriculum

The proposed program emphasizes development of the next generation of data scientists and engineers. Students graduating from the program will master the skills to build the infrastructure for delivering insights from raw data sources, as well as implement data science pipelines and workflows for acquiring, cleaning, transforming, analyzing, and visualizing data to provide descriptive, predictive, and prescriptive analytics. The program includes a curriculum to develop sought-after skills in various aspects of data science and engineering to prepare a skilled workforce in the area of data science.

The overall objectives of the proposed M.S. in Data Science program are to ensure that a graduating student possesses the following:

- Technical knowledge on data science principles, computational tools and algorithms, data science life cycle, data-driven problem-solving process, and management of data and information to solve data-intensive problems and to describe and transform data to knowledge/information.
- Effective communication and technical knowledge in cleaning, processing, analyzing data and effective visualization so that they are able to communicate solutions to stake holders and broader audience.
- Knowledge of modern machine learning techniques and data science tools and software skills to build predictive and analytical workflows.

To achieve these objectives, the curriculum will consist of 30 credit hours, including core courses that all students must complete, computer science (CS) elective courses, and other elective courses (cf. **Table 1**). Students must complete 15 credit hours of core courses that will provide sufficient background in data science, including Data Science, Mathematical Foundation of Data Science, Machine Learning, and Business Analytics. The curriculum will also require each student to complete a Capstone Project in Data Science course. They must also complete nine credit hours of elective coursework in CS, and six hours of elective coursework from other related disciplines. Depending upon the student's background, all 15 elective credits may be obtained from CS electives. Particularly noteworthy is that nine credits (one course per) are shared between the three programs being proposed together, **giving students a unique "bird's eye" view of the full data science and analytics space – from theory to practice to business implementation.**

The curriculum requires 30 hours for graduation, and students must earn a 3.0 overall GPA. One of the salient features of the MS curriculum is that each student must take the Capstone Project in Data Science course. Students in this course will engage in all data science life-cycle process topics including data collection, preprocessing, transformation, exploratory data analysis, visualization, predictive modeling, descriptive modeling, clustering, regression and classification, and data science project life cycle. The project topic will come from an academic research group, industry, government, other stakeholders, or other sources that mimic a real-world data science problem. Please refer to the syllabus of the capstone course for details about this. Almost all the courses are existing courses besides the capstone course.

Table 1: MS in Data Science Program Course Schedule

Year 1: Fall

SCH = Semester Credit Hours

Course #	Course Name	SCH....
CS 697AK	Introduction to Data Science	3
BSAN 775**	Perspectives on Business Analytics	3
MATH 746**	Introduction to Data Analytics	3

Year 1: Spring

Course #	Course Name	SCH....
CS 697AB	Machine Learning	3
DSE	Data Science Elective Course (see Table 2)	3
DEC/DSE	Discipline Elective Course or Data Science Elective Course (see Table 2)	3

Year 2: Fall

Course #	Course Name	SCH....
DSE	Data Science Elective Course (See Table 2)	3
DSE	Data Science Elective Course (See Table 2)	3
DEC/DSE	Discipline Elective Course or Data Science Elective Course (See Table 2)	3

Year 2: Spring

Course #	Course Name	SCH....
CS 896**	Capstone Project in Data Science	3

** represents new course

Total Number of Semester Credit Hours [30]

Table 2: MS in Data Science Program Courses

Course No.	Course Name	Credits
Five Required Courses—15 Credits		
CS 697AK	Introduction to Data Science	3
BSAN 775**	Perspectives on Business Analytics	3
MATH 746**	Introduction to Data Analytics	3
CS 697AB	Machine Learning	3
CS 896**	Capstone Project in Data Science	3
Three Data Science Elective Courses (DSE) —9 Credits		
CS 665	Introduction to Database Systems	3
CS 771	Artificial Intelligence	3
CS 797I	Introduction to Bioinformatics	3
CS 898AS	Deep Learning: Theory, Algorithms and Applications	3
CS 898AJ	Big Data Analytics	3
CS 898BE	Advanced Topics in Machine Learning	3
CS 898CA	Introduction to Intelligent Robotics	3
CS 898BA	Image Analysis and Computer Vision	3

Course No.	Course Name	Credits
CS 898AW	Artificial Intelligence for Robotics	3
CS 898D	Data Mining	3
CS 898BD	Deep Learning	3
Two Other Discipline Elective Courses (DCE) —6 Credits		
MIS 750	Business Intelligence and Analytics	3
STAT 763	Applied Regression Analysis	3
STAT 764	Analysis of Variance	3
STAT 776	Applied Statistical Methods	3
IME 780AP	Neural Networks and Machine Learning	3
IME 869	Bayesian Statistics and Uncertainty Quantification	3
SMGT 800	Analytics and Decision Making in Sport	3
IME 780AN	Big Data Analytics in Engineering (if CS 898AJ not taken)	3
IME 734	Introduction to Data Mining and Analytics (if CS 898D not taken)	
MIS 884	Database Management and Planning	3
BSAN 875	Advanced Business Analytics	3

** represents new course

VIII. CORE FACULTY

Faculty Name	Rank	Highest Degree	Tenure Track (Y/N)	Academic Area of Specialization	FTE Devoted to Proposed Program
Dukka KC*	Assoc. Professor	Ph.D	Y	Data Science/Bioinformatics	30%
Rajiv Bagai	Professor	Ph.D.	Y	Web Anonymity, Deductive Databases	10%
Sourabh Bose	Asst. Professor	Ph.D.	N	Machine Learning	10%
Hongsheng He	Asst. Professor	Ph.D.	Y	Intelligent Robotics	10%
Vinod Namboodiri	Professor	Ph.D.	Y	Mobile Computing	5%
Ajita Rattani	Asst. Professor	Ph.D.	Y	Biometrics, Computer Vision	20%
Sergio Salinas	Asst. Professor	Ph.D.	Y	Privacy and Security	5%
Kaushik Sinha	Assoc. Professor	Ph.D.	Y	Machine Learning/Data Mining	15%

*Director of Program

FTE: 1.0 FTE = Full-Time Equivalency; In FTE we also consider that all tenure track faculty have responsibilities for service and research in addition to teaching.

Number of Graduate Assistants Assigned to this program: 2 - 7

IX. Expenditure and Funding Sources

A. EXPENDITURES	First FY	Second FY	Third FY
Personnel—Reassigned or Existing Positions			
Faculty	\$103,931	\$107,049	\$213,261
Administrators (<i>other than instruction time</i>)	\$14,931	\$15,379	\$15,840
Graduate Assistants	\$19,200	\$19,776	\$40,145
Support Staff for Administration (<i>e.g., secretarial</i>)	\$7,665	\$7,895	\$8,132
Fringe Benefits (<i>total for all groups</i>)	\$44,154	\$45,479	\$83,305
Other Personnel Costs	--	--	--
Total Personnel Costs—Reassigned or Existing	\$189,881	\$195,578	\$360,683
Personnel—New Positions			
Faculty	--	\$95,000	\$95,000
Administrators (<i>other than instruction time</i>)	--	--	--
Graduate Assistants	--	\$19,776	\$33,990
Support Staff for Administration (<i>e.g., sec</i>)	--	--	--
Fringe Benefits (<i>total for all groups</i>)	--	\$31,977	\$33,399
Other Personnel Costs	--	--	--
Total Personnel Costs—New Positions	\$0	\$146,753	\$162,389
Start-Up Costs—One-Time Expenses			
Library/learning resources	--	--	--
Equipment/Technology	--	\$60,000	\$60,000
Physical Facilities: Construction or Renovation	--	--	--
Other	--	--	--
Total Start-Up Costs—One-Time Expenses	\$0	\$60,000	\$60,000
Operating Costs—Recurring Expenses			
Supplies/Expenses	\$2,000	\$3,000	\$4,000
Library/Learning Resources	--	--	--
Equipment/Technology	--	\$12,000	\$24,000
Travel	--	--	--
Other	--	--	--
Total Operating Costs—Recurring Expenses	\$2,000	\$15,000	\$28,000
GRAND TOTAL COSTS	\$191,881	\$417,331	\$611,072

B. FUNDING SOURCES (projected)	Current	First FY	Second FY	Third FY
Tuition/State Funds		\$143,688.60	\$397,028.70	\$506,950.20
College Course Fees		\$13,500	\$38,250	\$49,500
Student Support Fees		\$20,375.40	\$62,258	\$83,765.20
GRAND TOTAL FUNDING		\$177,564.00	\$497,536.70	\$640,215.40

C. Projected Surplus/Deficit (+/-) (Grand Total Funding <i>minus</i> Grand Total Costs)		(\$14,317.00)	\$80,205.70	\$29,143.40
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X. EXPLANATIONS OF EXPENDITURES AND FUNDING SOURCES

A. Expenditures

Personnel—Reassigned or Existing Positions

- **For the first year:**
 - The table from Core Faculty was taken and salaries are multiplied by the FTE. Note that this merely represents a slight reorganization as this cost is latent.
 - Administrator is calculated as 8% of the Chair's salary (again, a latent cost).
 - Two GTAs are calculated for the 270 credit hours.
 - Support staff cost is calculated as 25% of the current graduate secretary's salary (latent cost).
 - Fringe is calculated based on the current WSU fringe rates.
- **For the second year:**
 - All costs are increased by an estimated 3% of raise.
- **For the third year:**
 - All costs are increased by an estimated 3% of raise.
 - Expenses from the second year *new* are carried to the third year *existing* and increased by 3%.

Personnel—New Positions

- **For the first year:**
 - The estimated 15 student enrollment can be managed by existing resources as most of the costs are latent.
- **For the second year:**
 - We estimate the enrollment to increase by 30 students, meaning we should consider adding an additional faculty member. The cost in this case is 100% of the new faculty's salary as this program will be the reason to hire that faculty.
 - The increase in credit hours also requires 2 more GTAs (with a very lean 200CH/GTA estimate)
- **For the third year:**
 - We estimate the enrollment to increase by an additional 30 students, meaning a second new faculty member should be considered. Again, the cost is 100% of the new faculty's salary as this program will be the reason to hire this person.
 - The increase in credit hours will require an additional 3 GTAs (with a very lean 200CH/GTA estimate – averaging for this number to be an integer)
 - All costs are increased by an estimated 3% of raise

Start-Up Costs—One-Time Expenses

- **For the first year:**
 - Current resources are sufficient.
- **For the second year:**
 - 30 computers for a lab are included (at \$2k each) to keep up with student population growth.
- **For the third year:**
 - An additional 30 computers for a lab are included (at \$2k each) to keep up with continued student population growth.

Operating Costs—Recurring Expenses

- **For the first year:**

- Supplies (copying, office supplies) are estimated at \$2k.
- **For the second year:**
 - Supplies are estimated at \$3k.
 - 30 computers amortized over 5 years result in \$12k latent cost.
- **For the third year:**
 - Supplies are estimated at \$4k.
 - 60 computers amortized over 5 years result in \$24k latent cost.

B. Revenue: Funding Sources

Revenue is calculated based on the enrollment table from Section V:

- \$307.98 graduate tuition is calculated for half the full-time student credit hours.
- \$756.38 international graduate tuition is calculated for the other half of full-time student credit hours since we are expecting a large portion of the D.S. students to be international.
- All part-time student credit hours are calculated using the \$307.98 tuition.
- Student fee:
 - 7.00 or more credit hours \$679.18/fall or spring semester
 - 4.00-6.75 credit hours \$452.78/fall or spring semester
- \$50 per credit is added to all credit hours for the program fee applied to all College of Engineering programs.

C. Projected Surplus/Deficit

- While the first year shows a deficit, this is a latent cost (which is far outweighed by the opportunity cost of not developing the program). Most costs are covered through current resources with a small reorganization.
- With the addition of two faculty, we expect the program to grow, with healthy surpluses over time, which will allow for additional paid GTA's.

XI. REFERENCES

- American Statistical Association. (2019). New report highlights growing demand for data science, analytics talent, steps for higher ed and business recommended. American Statistical Association. <https://www.amstat.org/ASA/News/New-Report-Highlights-Growing-Demand-for-Data-Science-Analytics-Talent.aspx>
- Davenport, T.H. and Patil, D.J. (2012, October). Data scientist: The sexiest job of the 21st century. *Harvard Business Review*. <https://hbr.org/2012/10/data-scientist-the-sexiest-job-of-the-21st-century>
- Dignan, L. (2019, Dec. 10). Data science dominates LinkedIn's emerging jobs ranking. ZDNet. <https://www.zdnet.com/article/data-science-dominates-linkedins-emerging-jobs-ranking/>
- Flowers, A. (2019, Jan. 17). Data scientist: A hot job that pays well. Indeed Hiring Lab. <https://www.hiringlab.org/2019/01/17/data-scientist-job-outlook/>
- Junco, P.R. (2017, Sept.21). Data scientist personas: What skills do they have and how much do they make? *Glassdoor Economic Research*. <https://www.glassdoor.com/research/data-scientist-personas/>

(Kolakowski, N.) (2020, Feb. 13). Fastest-growing tech occupations include data scientists, engineers. Dice Insider. <https://insights.dice.com/2020/02/13/fastest-growing-tech-occupations-data-scientist-engineer/>

Smith Hanley Associates LLC. (2018, May 24). Top data scientist utilization by industry, sector, function. Smith Hanley Associates LLC. <https://www.smithhanley.com/2018/05/24/data-scientist-industry-sector-function/>

The world's most valuable resource is no longer oil, but data. *The Economist*. May 6, 2017 <https://www.economist.com/leaders/2017/05/06/the-worlds-most-valuable-resource-is-no-longer-oil-but-data>

U.S. Department of Labor. (n.d.). Occupational Outlook Handbook, Mathematicians and Statisticians. Bureau of Labor Statistics. <https://www.bls.gov/ooh/math/mathematicians-and-statisticians.htm>

Program Approval

Summary

Universities may apply for approval of new academic programs following the guidelines in the Kansas Board of Regents Policy Manual. Wichita State University has submitted an application for approval and the proposing academic unit has responded to all of the requirements of the program approval process.

October 7, 2020

I. General Information

A. Institution Wichita State University

B. Program Identification

Degree Level: Master's
Program Title: Business Analytics
Degree to be Offered: Master of Science in Business Analytics (MSBA)
Responsible Department or Unit: Finance, Real Estate, and Decision Sciences Department (FREDS)
CIP Code: 52.1301
Modality: Hybrid¹
Proposed Implementation Date: Spring 2021

Total Number of Semester Credit Hours for the Degree: 30

II. Clinical Sites:

Does this program require the use of Clinical Sites? No

III. Justification

Over the past five years, Wichita area companies have increasingly asked WSU to provide business analytics training for their current employees and future employees. As a result, the Center for Management Development (WSU's non-credit professional training organization) began to offer business analytics classes for these companies' employees. The Barton School of Business created a business analytics undergraduate certificate and minor, as well as a graduate MBA concentration. These options have allowed students to specialize in business analytics at the MBA level or while majoring in a traditional business discipline (e.g., Finance, Human Resource Management, and Marketing) at the undergraduate level. However, the demand for business analysts has increased significantly in recent years. Wichita companies have indicated the need for higher level analytical skills, which the Barton School is proposing to address through a Master's of Science degree in Business Analytics (MSBA). This program will help the Wichita area businesses, and their employees, gain the skills they need to be successful in the future.

Wichita State University is strongly dedicated to supporting and making teaching and research of data science and analytics an institutional priority. In support, WSU has recently invested in a High-Performance Computing (HPC) infrastructure and personnel. In this light, the MS in Business Analytics is one of the three distinct albeit aligned programs being proposed (the other two are in Engineering - MS in Data Science, and Liberal Arts and Sciences

¹ In hybrid modality, the students will take classes in face-to-face, online, and hybrid (combination of face-to-face and online) format. Classes may be 8-week or 16 weeks long.

- MS in Mathematical Foundations of Data Analysis) to further this priority. All three share foundational coursework in business analytics, as well as other electives offered among the three colleges.

IV. Program Demand

A. Survey of Student Interest

A survey was sent to Barton School graduate and undergraduate students (i.e., business students) asking about their interest in a graduate Business Analytics program at WSU. The key findings of the survey were:

Number of surveys administered:	1,983
Number of completed surveys returned:	128
Percentage of students interested in program:	66%

- Of the 34 graduate students who responded, 24 (70.6%) indicated they would be interested in pursuing a MSBA.
- Of the 94 undergraduates who responded, 60 (64%) indicated they would be interested in studying business analytics.
- The survey asked, on a scale 0-10, to what degree “would you be interested in seeking work that involves business analytics?” The mean score was 7.40.
- The survey asked, on a scale 0-10, to what degree “would you be interested in business analytics training to grow your skill set?” The mean score was 8.00.

B. Market Analysis

The FREDS department conducted a roundtable discussion of 12 Wichita area business leaders to assess their need for employees with business analytic skills. The business leaders represented Cargill, Koch, Spirit, Airbus, Textron Aviation, CURO Financial Technologies, IMA Financial Group, and Thrive Restaurant Group. The roundtable participants indicated they were interested in hiring full-time employees with business analytics skills in the near future. They were interested in hiring student interns, and they would be interested in conducting class projects with business analytic classes.

The key insights gained from the roundtable discussion are as follows:

- 84% of the participants indicate a need for graduates or students in the Analytics area.
- 91% agreed the need will be for both graduate and undergraduate students
- Participants indicated employees with analytics skills should have some experience with tools such as Excel, Power BI, Tableau, Alteryx, SQL, R, Python, and SAP.

A list of business analytics programs at competitor and peer universities is provided in Appendix 1. Specifically, our MSBA program is distinct from other programs in Kansas in multiple ways. The focus of the MSBA program at the Barton School will be primarily to serve full time and part time students and requires a capstone class that emphasizes applied learning. Our emphasis on an applied capstone experience is congruent with the mission and vision of Wichita State, which includes dynamic partnerships with our community businesses and organizations. Our students will be working closely with our community partners in their capstone project. We believe the program will also be attractive to potential students living in the I-35 corridor due to the competitive pricing offered by WSU.

V. Projected Enrollment for the Initial Three Years of the Program

Year	Headcount Per Year			Semester Credit Hrs. Per Year		
	Full- Time	Part- Time	Total	Full- Time	Part- Time	Total
Year 1	3	7	10	54	105	159
Year 2	5	20	25	126	405	531
Year 3	10	25	35	240	675	915

VI. Employment

The Bureau of Labor Statistics' (BLS) Occupational Outlook Handbook demonstrates the growing need of students with Analytics backgrounds in Business. The projected growth for operational research (OR) analysts from 2018 to 2028 is 26%. The BLS also shows the Wichita metropolitan area has a high demand for OR jobs with a 2018 annual mean wage of \$89,630 (highest range in the nation). The table below shows a summary of 2018 annual median salaries, 2018 actual jobs, and 2018-2028 growth projections for various Analytics jobs.

Occupation	2018 Annual Median Pay	2018 Number of Jobs	Job Outlook (2018-28)
Operations Research (OR) Analysts	\$83,390	109,700	+ 26% (average growth)
Budget Analysts	\$76,220	56,900	+ 4% (average growth)
Compensation, Benefits, and Job Analysis Specialists	\$63,000	88,700	+ 6% (average growth)
Financial Analysts	\$85,660	329,500	+ 6% (average growth)
Management Analysts	\$83,610	876,300	+14% (average growth)
Market Research Analysts	\$63,120	681,900	+20% (average growth)

In addition to the BLS data, results of the roundtable discussion of 12 Wichita area companies shows strong demand for talent with business analytics skills.

VII. Admission and Curriculum

A. Admission Criteria

Admission to the MSBA program will be granted to applicants who show a high likelihood of success in postgraduate business education. Previous academic training in business is not required for admission to the MSBA program. Applicants may have backgrounds in diverse fields such as engineering, liberal arts, education and health related areas. The specific content of a student's previous education is less important than the evidence that the student has sound scholarship, strong personal motivation, and the ability to develop business analytics skills.

To be admitted to the MSBA program, an applicant must:

- 1) possess an undergraduate degree
- 2) have a minimum GPA 3.00 (out of 4.00) in the last 60 hours of coursework (graduate and/or undergraduate). Students with a GPA lower than 3.00 may apply with GRE or GMAT scores for consideration
- 3) submit a personal statement that clearly states the applicant's reason for seeking admission to the program (500 words maximum)
- 4) submit a professional resume

- 5) meet the minimum TOEFL and IELTS requirements set by the WSU Graduate School (only for students with English as a second language)

Applicants needing a F1 visa must also provide documentation for financial support.

B. Curriculum

The program is designed to attract a wide range of domestic and international professionals. The curriculum will focus on developing contemporary competencies via innovative hands-on activities and industry practices. To serve the needs of professionals in the field, the MSBA program will offer two tracks - Management and Data Science:

Management track focuses on developing capabilities and mastery in leading analytics initiatives.

Data Science track aims to impart mastery in the use of innovative tools and techniques in data analytics.

The overall objectives of the proposed M.S. in Business Analytics are to ensure that graduating students possess the following:

- The ability to understand the different business domains and communicate with stakeholders to frame the business problem
- Learn to collect data form various sources, transform it, organize it into a database, then query it to get the necessary data for analysis
- Understand the different statistical and mathematical models, and accompanying software, used in Descriptive, Predictive, and Prescriptive Analytics
- Manage and deploy a complete Analytics solution to a real business problem, from data collection to finding the appropriate Analytics solution to communicating the solution with stakeholders

Both programs require pre-requisites (preparatory requirements) that can be waived based on the undergraduate degree and professional background of the applicant. The students will be required to complete 24 credit hours of core courses and select six credit hours of elective courses for a total of 30 credits.

Preparatory Requirements (May be waived with equivalent courses as the undergraduate or graduate levels or with appropriate professional experience.)

- Calculus
- Statistics
- Fundamentals of Accounting
- Fundamentals of Finance
- Basics of Marketing
- Basics of Management
- Operations Management

M.S. in Business Analytics (MSBA) – Management Track

Year 1: Fall

SCH = Semester Credit Hours

Course #	Course Name	SCH....
BSAN 775	Perspectives on Business Analytics	3
MIS 884	Database Management and Planning	3
MGMT 803	Decision Making Analysis	3

Year 1: Spring

Course #	Course Name	SCH....
BSAN 875	Advanced Business Analytics	3
MIS 750	Business Intelligence and Analytics	3
ECON 803	Analysis of Business Conditions and Forecasting (or IME 880Y – Forecasting and Analytics)	3

Year 2: Fall

Course #	Course Name	SCH....
BSAN 734	Introduction to Data Mining and Analytics (or IME 734)	3
	Elective 1	3
	Elective 2	3

Year 2: Spring

Course #	Course Name	SCH....
BSAN 885	Business Analytics Capstone	3

Total Number of Semester Credit Hours [30]

Elective Courses (6 credits)

- ACCT 860 – Accounting Information Systems
 - DS 755 – Project Management
 - DS 860 – Enterprise Resource Planning
 - HRM 803 – Human Resource Analytics
 - FIN 790A – Finance Analytics: Contemporary and Traditional Topics
 - FIN 865 – Advanced Investment and Portfolio Management
 - MIS 690D – Cloud Computing
 - CS 697AK – Perspectives on Data Science
 - IME 883 – Supply Chain Analytics
 - MATH 746 – Perspectives on Mathematical Foundations of Data Science
 - SMGT 800 – Analytics & Decision Making in Sports
- Any COURSE with program director consent

M.S. in Business Analytics (MSBA) – Data Science Track**Year 1: Fall****SCH = Semester Credit Hours**

Course #	Course Name	SCH....
BSAN 775	Perspectives on Business Analytics	3
CS 697AK	Perspectives on Data Science	3
MATH 746	Perspectives on Mathematical Foundations of Data Science	3

Year 1: Spring

Course #	Course Name	SCH....
BSAN 875	Advanced Business Analytics	3
BSAN 734 or IME 734	Introduction to Data Mining and Analytics	3
CS 697AB	Machine Learning	3

Year 2: Fall

Course #	Course Name	SCH....
MIS 884	Database Management and Planning	3
	Elective 1	3
	Elective 2	3

Year 2: Spring

Course #	Course Name	SCH....
BSAN 885	Business Analytics Capstone	3

Total Number of Semester Credit Hours [30]

Elective Courses (6 credits)

- DS 860 – Enterprise Resource Planning
- MIS 690D – Cloud Computing
- MIS 750 – Business Intelligence and Analytics
- FIN 790A – Finance Analytics: Contemporary and Traditional Topics
- FIN 865 – Advanced Investment and Portfolio Management
- ECON 803 – Analysis of Business Conditions and Forecasting or IME 880Y – Forecasting and Analytics
- IME 780AN – Big Data Analytics in Engineering
- IME 780AP – Neural Networks and Machine Learning
- PSY 902/903 – Advanced Statistics
- Any course with program director consent

VIII. Core Faculty

Faculty Name	Rank	Highest Degree	Tenure Track Y/N	Academic Area of Specialization	FTE to Proposed Program
Sue Abdinnour	Program Director, Professor	PhD	Y	Decision Sciences	0.5
New Faculty Member (start in Fall 2022)	Assistant Professor	PhD	Y	Business Analytics	1.0

FTE: 1.0 FTE = Full-Time Equivalency Devoted to Program

In addition to the faculty listed in the table, four additional faculty members from the Barton School of Business will teach classes that are included in the core curriculum of the program. These classes are currently included in other master’s programs at the Barton School of Business and are taught on a regular basis. Similarly, three additional faculty from the College of Engineering and one faculty from the College of Liberal Arts will teach classes that are included in the core curriculum of the program, but are also already offered in those colleges on a regular basis. Support letters from the department chairs in those colleges, and the availability of capacity in the existing classes, are available in appendix 2. This comes to a total of 3.5 FTE faculty required for teaching the core classes of this program. The inter-disciplinary nature of the program and the data science track opens opportunities for engaging faculty members from other colleges as well. There are many courses from various colleges listed as elective courses that students can take to fulfill the requirements for this program.

Other faculty from the Business School teaching in the MSBA program include:

Khawaja Saeed	Professor	PhD
Steve Farmer	Professor	PhD
Akmal Mirsadikov	Assistant Professor	PhD
Farhad Tadayon	Adjunct, Spirit Aero systems	PhD
Mike Bush	Senior Research Economist, CEDBR	PhD

Number of graduate assistants assigned to this program: first year: 1; second and third years: 2.

IX. Expenditure and Funding Sources (*List amounts in dollars. Provide explanations as necessary.*)

A. EXPENDITURES	First FY	Second FY	Third FY
Personnel – Reassigned or Existing Positions			
Faculty	\$74,300	\$74,300	\$74,300
Administrators (<i>other than instruction time</i>)	TBD	TBD	TBD
Graduate Assistants	0	0	0
Support Staff for Administration (<i>e.g., secretarial</i>)	0	0	0
Fringe Benefits (<i>total for all groups</i>)	\$22,290	\$22,290	\$22,290
Other Personnel Costs	0	0	0
Total Existing Personnel Costs – Reassigned or Existing	\$96,590	\$96,590	\$96,590
Personnel – New Positions			
Faculty	0	\$126,000	\$126,000
Overloads and Adjuncts	\$16,000	0	\$0
Administrators (<i>Program Coordinator Stipend</i>)	0	0	0
Graduate Assistants	\$12,000	\$24,000	\$24,000
Support Staff for Administration (<i>e.g., secretarial</i>)	0	\$10,000	\$10,000
Fringe Benefits (<i>total for all groups</i>)	\$6,480	\$44,160	\$44,160
Other Personnel Costs	0	0	0
Total Existing Personnel Costs – New Positions	\$34,480	\$204,160	\$204,160
Start-up Costs - One-Time Expenses			
Library/learning resources	0	0	0
Equipment/Technology	0	0	0
Physical Facilities: Construction or Renovation	0	0	0
Other	0	0	0
Total Start-up Costs	0	0	0
Operating Costs – Recurring Expenses			
Supplies/Expenses	\$1,000	\$3,000	\$3,000
Library/learning resources	0	0	0
Equipment/Technology	\$5,000	\$10,000	\$10,000
Travel	0	\$8,000	\$8,000

Other	\$4,000	\$9,000	\$9,000
Total Operating Costs	\$10,000	\$30,000	\$30,000
GRAND TOTAL COSTS	\$141,070	\$330,750	\$330,750

B. FUNDING SOURCES <i>(projected as appropriate)</i>	Current	First FY (New)	Second FY (New)	Third FY (New)
Tuition / State Funds	0	\$61,076	\$191,787	\$335,610
Student Fees	0	\$11,206	\$36,900	\$62,822
Barton School Program Fees	0	\$7,950	\$26,550	\$45,750
Other Sources – School Support	0	0	0	0
GRAND TOTAL FUNDING	0	\$80,232	\$255,237	\$444,182
C. Projected Surplus/Deficit (+/-) (Grand Total Funding <i>minus</i> Grand Total Costs)		(\$60,838)	(\$75,513)	\$113,432

X. Expenditures and Funding Sources Explanations

A. Expenditures

Personnel—Reassigned or Existing Positions

- **For the first, second, and third year:**
 - Faculty: Half FTE of an existing faculty position will be reassigned to the program.
 - A significant number of the courses in the MSBA program are currently offered, and existing faculty members will continue to teach these courses.
 - Fringe is calculated based on the current WSU fringe rates.
- **For the second year:**
 - Faculty overload and adjunct instructor pay is eliminated with hiring of a new faculty
 - Administrative support staff is budgeted at \$10,000
- **For the third year:**
 - Administrative support staff is budgeted at \$10,000

Personnel—New Positions

- **For the first year:**
 - The necessary MSBA courses will be taught by an adjunct professor or/and faculty receiving overload compensation. \$16,000 is budgeted for this purpose.
 - Program launch will be assisted by the hiring of one graduate research assistant (GRA)

- Fringe is calculated based on the current WSU fringe rates.
- **For the second and third year:**
- The estimated growth of enrollments requires an additional new faculty. The cost is 100% of the new faculty's salary. This eliminates the budget for adjuncts/overloads in year 1.
- The estimated enrollment growth also requires an additional GRA.
- Fringe is calculated based on the current WSU fringe rates.

Start-Up Costs—One-Time Expenses

- **For the first year:**
- Current resources are sufficient.
- **For the second year:**
- Estimated that current resources will be sufficient
- **For the third year:**
- Estimated that current resources will be sufficient

Operating Costs—Recurring Expenses

- **For the first year:**
- Supplies (copying, office supplies) are estimated at \$1,000.
- Equipment/Technology is estimated at \$5,000
- Other expenses estimated at \$4,000
- **For the second year:**
- Supplies are estimated at \$3,000.
- Equipment/Technology expenses are estimated at \$10,000
- Travel expenses are estimated at \$8,000
- Other Expenses are estimated at \$9,000
- **For the third year:**
- Supplies are estimated at \$3,000.
- Equipment/Technology expenses are estimated at \$10,000
- Travel expenses are estimated at \$8,000
- Other Expenses are estimated at \$9,000

B. Revenue: Funding Sources

Revenue is calculated based on the enrollment table from Section V:

- \$307.98 per credit of graduate tuition is calculated for half the full-time student credit hours.
- \$756.38 per credit of graduate tuition (out-of-state) is calculated for the other half of full-time student credit hours since we are expecting a portion of the students to be international.
- All part-time student credit hours are calculated using the \$307.98 per credit tuition.
- Student fee:
 - 7.00 or more credit hours \$679.18/fall or spring semester
 - 4.00-6.75 credit hours \$452.78/fall or spring semester
 - Summer Fees \$113.12/summer session
- Program fee:
 - \$50 per credit is applied as a program fee for to all College of Business programs

C. Projected Surplus/Deficit

The reassignment of an existing faculty member and hiring of the new faculty in year 2, the program will generate a deficit in years 1 and 2 and a surplus in year 3 as (\$60, 838), (\$75,513), and \$113, 432 respectively. Once the cost of a new faculty member hire is absorbed in year 2, the surplus in year 3 will continue to grow with growth of enrollments in years 4 and beyond.

XI. References

Association to Advance Collegiate Schools of Business. (2019). 2018-19 Staff Compensation and Demographics Survey: Executive Summary. <https://www.aacsb.edu/data/data-reports/survey-reports/staff-compensation-and-demographics>

U.S. Department of Labor. (2018). Occupational Outlook Handbook – Business and Financial Occupations. Bureau of Labor Statistics. <https://www.bls.gov/ooh/business-and-financial/home.htm>.

Appendix 1: Analysis of Program at Peer and Competitor Institutions

	College/School	Analytics Graduate Program
WSU Peer Institutions	New Mexico State University	College of Business NA
	University of Massachusetts – Lowell	Manning Business School M.Sc. in Business Analytics
	University of Nevada Reno	College of Business Online M.Sc. in Business Analytics
	University of North Dakota	College of Business NA
	Wright State University	College of Business Business Analytics Certificate
WSU Aspirant Institutions	Auburn University	School of Business NA
	Clemson University	College of Engineering MBA in Business Analytics
	Oklahoma State University	School of Business Online M.Sc. in Business Analytics and Data Science
	University of Akron	College of Business Administration MBA Concentration
	University of Texas El Paso	College of Business Administration NA
I-35 Major City Universities	UT – Austin	School of Business M.Sc. in Business Analytics
	UT – Dallas	School of Management M.Sc. in Business Analytics
	University of Dallas	College of Business M.Sc. in Business Analytics
	UT – San Antonio	College of Business M.Sc. in Data Analytics
	Texas A&M – San Antonio	College of Business M.Sc. in Business Analytics
	Oklahoma State University	School of Business M.Sc. in Business Analytics
	University of Kansas	School of Business M.Sc. in Business Analytics
	University of Missouri - KC	School of Management NA
	Texas Christian University	School of Business Analytics Certificate
	University of Minnesota	School of Management M.Sc. in Business Analytics
Kansas State University	College of Business M.Sc. in Data Analytics	

Program Approval

Summary

Universities may apply for approval of new academic programs following the guidelines in the Kansas Board of Regents Policy Manual. Wichita State University has submitted an application for approval and the proposing academic unit has responded to all of the requirements of the program approval process.

October 7, 2020

I. General Information

A. Institution Wichita State University

B. Program Identification

Degree Level: Master's Degree
Program Title: The Mathematical Foundations of Data Analysis
Degree to be Offered: Master of Sciences
Responsible Department or Unit: Mathematics, Statistics, & Physics
CIP Code: 30.7001
Modality: Face-to-Face
Proposed Implementation Date: Spring 2021

Total Number of Semester Credit Hours for the Degree: 30

II. Clinical Sites: Does this program require the use of Clinical Sites? No

III. Justification

Big data has become the revolution of Information Technology which is transforming industries around the world. Along with global demand for employees with expertise in handling “big data”, there has been a growing need for local Wichita companies as well. Wichita State University (WSU) is strongly dedicated to supporting this data revolution by making teaching and research of data science and analytics an institutional priority. As such, at WSU, three distinct albeit aligned interdisciplinary data science master programs are being proposed in parallel. In support, WSU has recently invested in a High-Performance Computing (HPC) infrastructure and personnel.

The MS in Mathematical Foundations of Data Analysis is one of the three distinct albeit aligned programs being proposed. This interdisciplinary program focuses on the mathematical foundation behind data analysis methods. This program is designed for individuals who wish to pursue a mathematical focus within data science at the graduate level.

The primary goal of this program is the fundamental understanding of the mathematics behind data science algorithms and methods. This program will produce professionals who can communicate the principles of data science statistics and analytics and assist with the design and implementation of data systems. However, this will not be a traditional master's program in a math/statistics department that only produces theoretical professionals. This interdisciplinary program will require students to study data science perspectives and applications in business and engineering. Graduates will have not only in-depth mathematic and statistical understanding of data analysis methods, but also the knowledge of how to apply these methods to different areas within this ever-growing field. We believe this interdisciplinary approach is crucial in creating well-rounded Data Analysis

professionals.

The proposed programs will advance WSU’s mission as an economic driver for Kansas and the greater public good by equipping students with the analytical tools they need to thrive in the big data era.

These programs will also meet specific goals in WSU’s Strategic Plan:

- Every student in our proposed programs will gain applied learning experience by working on projects and research within the industry and the community. This will meet the applied learning goal.
- Each student will be required to take core perspective courses from the Business and Engineering School, and they will have the opportunity to take electives outside the Math Department. This will meet the interdisciplinary curricula goal.
- The proposed programs will offer students the greatest number of choices when selecting a career in data science, from theoretical research to technical applications in different fields. This will meet the goal of quality educational opportunities.
- The proposed programs will create opportunities for students to discover new models and creative analytics solutions, any of which may become the next big idea in data science. This will meet the goal of discovery, creation, and transfer of new knowledge.

IV. Program Demand:

The proposed program, once approved, would be the first interdisciplinary data science master’s program in Kansas with an emphasis on a mathematical foundation. KSU offers an interdisciplinary MS program in data science but only through the Business School with an emphasis on business applications. KSU’s Statistics Department also offers a data science and analytics track for its MS program, but it is not an interdisciplinary program. The same is true for KU’s MS in statistics with an emphasis in analytics or data science. At WSU, we already offer a Graduate Certificate in the Mathematical Foundations of Data Analytics in the math department, but it is only a one-year program and is not interdisciplinary in nature.

Thus, the proposed interdisciplinary data science program would be unique in Kansas, attracting many students and leading to enrollment growth for WSU.

The innovation campus at WSU would provide a unique locational advantage for this interdisciplinary master’s program. Students in the proposed program would be required to take a data analysis capstone course, which is an individual, directed study in an area of data analysis that is appropriate for each student’s career objectives. On-campus research and applied learning partners (Airbus, Dassault Systemes, and Spirit AeroSystems) would undoubtedly provide many research internship opportunities for students as well.

A. Survey of Student Interest

Number of surveys administered:	__30__
Number of completed surveys returned:	__30__
Percentage of students interested in program: ...	__100%__

Results of a survey from 30 current undergraduate and graduate students in the math department provides descriptive information regarding the need of an interdisciplinary master’s degree program in Mathematical Foundations of Data Analysis. Twenty percent of the respondents are undergraduate students, 33% of the respondents are the current master students, and the rest are PhD students. All the respondents are interested in choosing this new interdisciplinary master’s degree program. Seventy-three percent of respondents would choose this interdisciplinary data science program if they were given the opportunity to select the program again and the rest of the respondents answered that they may consider choosing this program. Eighty-three percent of the

respondents believed that this new program would benefit the students of Wichita State and the rest thought it maybe benefit to the Wichita State. Ninety-three percent of the respondents would recommend this interdisciplinary program to their friends at Wichita State. Some of the respondents even wanted to consider choosing this master’s program as the second program to study.

B. Market Analysis

A quick look at most companies big and small suggests the kind of jobs that are going to be in demand for quite some time and most of the ones that deal with mathematics have to do with analyzing data. Data Scientist has been named the best job in America for three years running by Forbes Online, with a median base salary of \$110,000 and 4,524 job openings.

To keep up with the explosion of big data across all industries, colleges and universities have debuted many data analytics programs during the past few years, mostly at the graduate level. The number of master programs in data science has been growing rapidly. Currently, there are more than 250 programs offering master's degrees in analytics or data science at universities based in the U.S., which now produce an estimated 8,000 to 10,000 graduates per year.

The reality is that the demand for the data science professionals is so strong that many companies have begun to hire students from the regular statistics program as data analysis professionals. In 2019 Harry Collins from our MS program was hired as a data analyst II and a head of the department in Washington, DC. Currently, one of our master students is working for the police department as a data analyst. On one hand, this fact has shown the strong demand for the data science professionals, on the other hand, it tells us: If our regular master’s program can already produce data science professionals liked by the industry, we have no reason not to be excited about the future graduates from this new interdisciplinary data analysis program.

V. Projected Enrollment for the Initial Three Years of the Program

Year	Headcount Per Year		Sem Credit Hrs Per Year	
	Full- Time	Part- Time	Full- Time	Part- Time
Implementation	10	0	180	0
Year 2	15	5	390	45
Year 3	15	5	450	90

VI. Employment

The Bureau of Labor Statistics (BLS) clearly demonstrates the growing need of students with analytics backgrounds in business, computer science, and mathematics. The BLS’s publication “Beyond the Numbers” from June 2018 projects growth of operational research (OR) analysts and statisticians as 27.4% and 33.8% respectively from 2016 to 2026. The BLS also shows Wichita, KS is one of the metropolitan areas with high demand for such jobs. A report by IBM predicts demand for data professionals will soar to 28% in 2020 which translates to increase by 364,000 openings to 2,720,000.

In addition to data from BLS and other published reports, the Business School conducted a study to assess the demand for graduates with Analytics background in Wichita, KS. The first study was a roundtable of executives from local businesses. A total of 12 individuals representing 8 companies participated (Spirit, Textron, Airbus, Koch, Cargill, Ametek, Johns Manville, Thrive Restaurant Group). We had them fill a survey to start with, then introduced them to the interdisciplinary master’s program followed by a discussion. The survey results clearly showed that 91% are in need of hiring full time students and 82% in need of hiring interns. There was consensus about the need to introduce interdisciplinary courses from computer science and mathematics. When asked

which department in business they would need to hire analytics expertise in, the highest was operations at 91% and when asked what tools are required of graduates, the highest was Excel.

VII. Admission and Curriculum

A. Admission Criteria

Students will be admitted to full graduate standing in the Mathematical Foundations of Data Analysis program if they have the equivalent of an undergraduate major in mathematics, have a grade point average of at least 3.000 in mathematics and computer sciences courses and meet Graduate School admission requirements. Students may be admitted on a conditional basis if they do not have all the pre-requisite coursework.

B. Curriculum

30 hours are required for graduation, and students must earn a 3.0 overall GPA, a 3.0 GPA in courses required in the program.

Year 1: Fall

SCH = Semester Credit Hours

Course #	Course Name	SCH....
Math 746	Data Perspectives in Mathematics	3
CS 697AK	Data Perspectives in Engineering	3
DS 775	Data Perspectives in Business	3

Year 1: Spring

Course #	Course Name	SCH....
Math 553	Mathematical Modeling	3
CS 697AB	Machine Learning	3
	Statistical Electives	3

Year 2: Fall

Course #	Course Name	SCH....
	Statistical Electives	3
	Computing Elective	3
	Other Elective	3

Year 2: Spring

Course #	Course Name	SCH....
Math 802	Data Analytics Capstone	3

Total Number of Semester Credit Hours **[30]**

Statistical Electives Courses

Stat 763	Applied Regression Analysis	3
Stat 764	Analysis of Variance	3
Stat 776	Applied Statistical Methods II	3

Computing Elective Courses

Stat 774	Statistical Computing	3
Math 751	Numerical Linear Algebra	3
CS 560	Design and Analysis of Algorithms	3

Other Elective Courses

CS 665	Introduction to Database	3
MIS 600	Database Management System	3
IME 780AN	Big Data Analytics in Engineering	3
DS 875	Advanced Business Analytics	3

VIII. Core Faculty

Faculty Name	Rank	Highest Degree	Tenure Track Y/N	Academic Area of Specialization	FTE to Proposed Program
Thomas Delillo	Professor	PhD in Mathematics	Y	Applied/Computational Math	0.3
Adam Jaeger	Assistant Professor	PhD in Statistics	Y	Statistics and Data Science	0.2
Tianshi Lu	Associate Professor	PhD in Mathematics	Y	Applied/Computational Math	0.1
Xiaomi Hu	Professor	PhD in Statistics	Y	Statistics	0.1
Chunsheng Ma	Professor	PhD in Statistics	Y	Statistics	0.1
Jason Clemens	Post Doc	PhD in Mathematics	N	Data Science	0.1
Ziqi Sun	Professor	PhD in Mathematics	Y	PDE and Inverse Problems	0.1

IX. Expenditure and Funding Sources

A. EXPENDITURES	First FY	Second FY	Third FY
Personnel—Reassigned or Existing Positions			
Faculty	\$79,692	\$82,083	\$84,546
Administrators (<i>other than instruction time</i>)	\$6,562	\$6,759	\$6,961
Graduate Assistants	--	--	--
Support Staff for Administration (<i>e.g., secretarial</i>)	\$6,290	\$6,479	\$6,673
Fringe Benefits (<i>total for all groups</i>)	\$27,763	\$ 28,596	\$ 29,454
Other Personnel Costs	--	--	--
Total Personnel Costs—Reassigned or Existing	\$120,307	\$123,917	\$127,634
Personnel—New Positions			
Faculty	--	\$80,000	\$82,400
Administrators (<i>other than instruction time</i>)	--	--	--
Graduate Assistants	--	\$15,038	\$30,996
Support Staff for Administration (<i>e.g., sec</i>)	--	--	--
Fringe Benefits (<i>total for all groups</i>)	--	\$24,145	\$25,019
Other Personnel Costs	--	--	--
Total Personnel Costs—New Positions	\$0	\$119,183	\$ 138,415

A. EXPENDITURES	First FY	Second FY	Third FY
Start-Up Costs—One-Time Expenses			
Library/learning resources	--	--	--
Equipment/Technology	--	\$10,000	\$10,000
Physical Facilities: Construction or Renovation	--	--	--
Other	--	--	--
Total Start-Up Costs—One-Time Expenses	\$0	\$10,000	\$10,000
Operating Costs—Recurring Expenses			
Supplies/Expenses	\$1,000	\$2,000	\$3,000
Library/Learning Resources	--	--	--
Equipment/Technology	--	\$2,000	\$4,000
Travel	--	--	--
Other	--	--	--
Total Operating Costs—Recurring Expenses	\$1,000	\$4,000	\$7,000
GRAND TOTAL COSTS	\$ 121,307	\$257,100	\$283,049

B. FUNDING SOURCES (projected)	Current	First FY (New)	Second FY (New)	Third FY (New)
Tuition/State Funds		\$95,792	\$221,409	\$267,199
Student Fees		\$13,584	\$36,223	\$46,410
Other Sources		--	--	--
GRAND TOTAL FUNDING		\$109,376	\$257,632	\$313,609

C. Projected Surplus/Deficit (+/-) (Grand Total Funding <i>minus</i> Grand Total Costs)		(\$11,931)	\$532	\$30,560
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X. Expenditures and Funding Sources Explanations

A. Expenditures

Personnel—Reassigned or Existing Positions

- **For the first year:**
 - Faculty: Each core faculty's salary is multiplied by the FTE and then take the sum.
 - Administrator: 5% of the Chair's salary.
 - Support staff for Administration: 20% of the current graduate secretary's salary.
 - Fringe is calculated based on the current WSU fringe rates.
- **For the second year:**
 - 3% of raise for all the costs.
- **For the third year:**
 - 3% of raise for all the costs.

Personnel—New Positions

- **For the first year:**
 - The estimated 10 student enrollment can be managed by existing resources as the existing MS program may undergoes a potential shrinking.

- **For the second year:**
 - The estimated 25 student enrollment requires an additional faculty member. The cost is 100% of the new faculty's salary.
 - The estimated 25 student enrollment requires an additional GTA.
- **For the third year:**
 - The estimated 30 student enrollment require 2 more GTAs.
 - All costs are increased by an estimated 3% of raise

Start-Up Costs—One-Time Expenses

- **For the first year:**
 - Current resources are sufficient.
- **For the second year:**
 - Due to the enrollment growth, we need 10 computers for a lab (at \$2k each).
- **For the third year:**
 - Due to the enrollment growth, we need additional 10 computers for a lab (at \$2k each).

Operating Costs—Recurring Expenses

- **For the first year:**
 - Supplies (copying, office supplies) are estimated at \$1k.
- **For the second year:**
 - Supplies are estimated at \$2k.
 - 10 computers amortized over 5 years result in \$4k.
- **For the third year:**
 - Supplies are estimated at \$3k.
 - 20 computers amortized over 5 years result in \$8k

B. Revenue: Funding Sources

Revenue is calculated based on the enrollment table from Section V:

- \$307.98 of graduate tuition is calculated for half the full-time student credit hours.
- \$756.38 of graduate tuition (out-of-state) is calculated for the other half of full-time student credit hours since we are expecting a large portion of the D.S. students to be international.
- All part-time student credit hours are calculated using the \$307.98 tuition.
- Student fee:
 - 7.00 or more credit hours \$679.18/fall or spring semester
 - 4.00-6.75 credit hours \$452.78/fall or spring semester

XI. References

Columbus, Louis. (2018, Jan. 29). Data scientist is the best job in America according to Glassdoor's 2018 ranking. *Forbes Online*. <https://www.forbes.com/sites/louiscolombus/2018/01/29/data-scientist-is-the-best-job-in-america-according-glassdoors-2018-rankings/#296709025535>.

U.S. Department of Labor. (2018). Occupational Outlook Handbook – Business and Financial Occupations. U.S. Bureau of Labor Statistics. <https://www.bls.gov/ooh/business-and-financial/home.htm>.

Program Approval

Summary

Universities may apply for approval of new academic programs following the guidelines in the Kansas Board of Regents Policy Manual. The University of Kansas has submitted an application for approval and the proposing academic unit has responded to all of the requirements of the program approval process.

October 7, 2020

I. General Information

A. Institution University of Kansas

B. Program Identification

Degree Level: Master's
Program Title: Master of Bioengineering
Degree to be Offered: Master of Engineering
Responsible Department or Unit: School of Engineering
CIP Code: 14.0501
Modality: Face-to-Face
Proposed Implementation Date: Fall 2021

Total Number of Semester Credit Hours for the Degree: 30

II. Clinical Sites: Does this program require the use of Clinical Sites? No

III. Justification

The Master of Engineering (ME) in Bioengineering reflects the mission statement of KU and its commitment “to lift students and society by educating leaders, building healthy communities and making discoveries that change the world”. The program will educate leaders, will help build healthy communities, and will make discoveries through the work of these leaders.

The ME in Bioengineering degree is an efficient way for KU undergraduates and others with undergraduate degrees to obtain more in-depth background and credentials in bioengineering prior to seeking employment or while being employed. The degree will prepare graduates to be more effective in their careers in medicine, in established commercial firms, and with entrepreneurship in a start-up company. The general goals and objectives for the ME in Bioengineering degree are:

1. Provide students with an in-depth understanding of mathematics, engineering principles, physics, chemistry, physiology, and modern biology;
2. Train students to apply basic sciences to biological problems, using engineering principles;
3. Train students to apply bioengineering analysis to commercially relevant problems.

The ME degree is a coursework only master's degree, meaning it does not have a thesis option. It is identical to the existing Master of Science (MS) in Bioengineering degree at KU with the exception that the MS requires a thesis and a thesis defense examination, while the ME substitutes coursework credit hours for thesis credit hours. For many interested in a career in industry, the time required to write and

defend a thesis are barriers to obtaining a Master’s degree, making the ME an attractive option for some professionals.

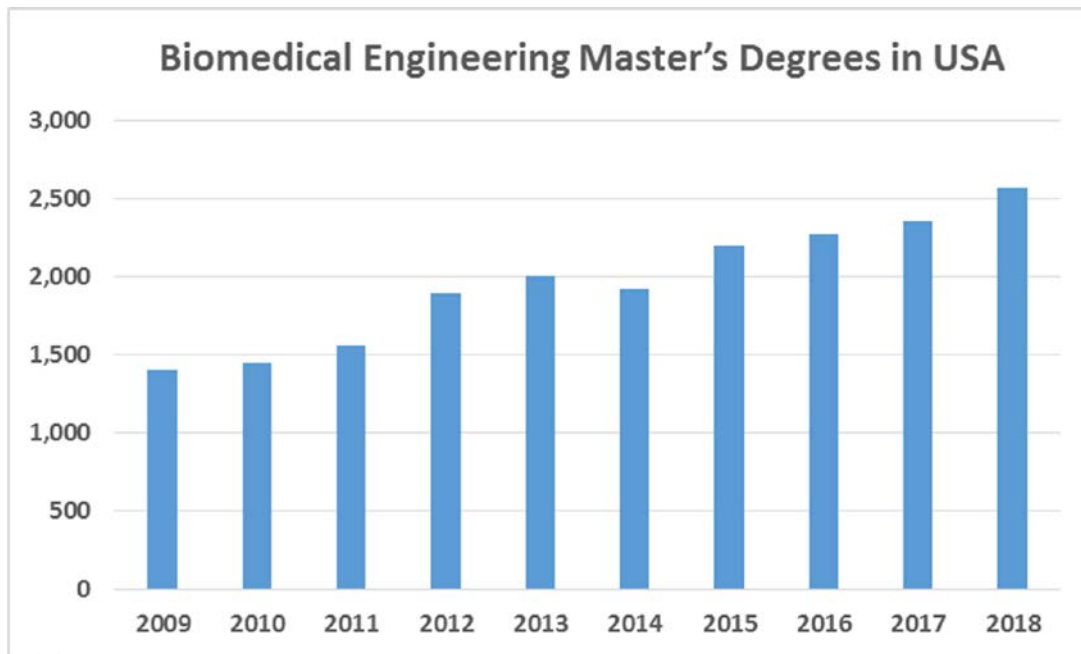
The proposed ME degree is in response to the expanding Kansas City region biosciences community. The degree is designed to be more accessible and appealing to regional professionals whose focus is on working in industry and who are looking to further their education and improve their skills. To that end the ME in Bioengineering, like the MS, has the following six tracks available: Computational Bioengineering; Biomechanics & Neural Engineering; Biomedical Product Design & Development; Biomaterials & Tissue Engineering; Biomolecular Engineering; and Bioimaging.

Also, because KU does not offer an undergraduate Bioengineering/Biomedical Engineering degree, the ME in Bioengineering will be attractive to current undergraduates who are interested in the biomedical industry. The addition of the ME degree will provide another option that is more appealing to some students, and should increase KU’s overall Master’s applications for Bioengineering.

IV. Program Demand: Market Analysis

The national demand for biomedical engineering degrees in general and Master’s degrees in Biomedical Engineering continues to grow by about 7% per year (Figure 1). The proposed degree targets science and engineering bachelor’s degree holders who seek a career at the interface between science, medicine and engineering. Similar programs are in place at top academic institutions around the country (e.g. Johns Hopkins, Georgia Tech, Duke, etc.). While WSU also offers an MS in Bioengineering, there are currently no programs that offer a professional coursework-only ME Degree in Bioengineering or Biomedical Engineering at any academic institution in the state of Kansas, only two in the Big 12, and only three regionally.

Figure 1. BME Master’s Degrees Data from the American Society of Engineering Education July 2019 report for the 2017-2018 Academic Year.



KU has had strong demand for graduate degrees in Bioengineering, and applications for fall semester of

2020 hit an all-time high. Thus, the demand for Bioengineering/Biomedical engineering remains strong and growing. Enrollments in the past few years have been between 50 and 60 graduate students; about half of those are typically MS students. Nationally, the number of Master’s degrees awarded in Biomedical Engineering has nearly doubled in the last 10 years, and we project that this expansion and growth will continue for the foreseeable future. The rate of increase is among the very fastest-growing interdisciplinary degree programs in the USA. Many potential graduate students do not seek the advanced degree because of the time required for research and writing of a Master’s thesis. This ME degree will capture students focused on industrial positions and who are not seeking to complete a thesis. The degree could be completed within one year of fulltime coursework.

V. Projected Enrollment for the Initial Three Years of the Program

Year	Headcount Per Year		Sem Credit Hrs Per Year	
	Full- Time	Part- Time	Full- Time	Part- Time
Implementation	3	1	90	6
Year 2	4	2	120	18
Year 3	4	2	120	30

VI. Employment

KU’s Bioengineering Graduate Program currently has a placement rate of over 95%. And even with the effects of the novel coronavirus, the job outlook is good. According to the US Bureau of Labor Statistics, the median salary of a bioengineer in 2019 was \$91,410 per year (though the data does not account for level of degree).

Thus, Bioengineering is an appealing degree for the interesting area of work, the strong job market and the competitive compensation. According to the Wichita State University Center for Economic Development and Business Research employment forecast from October 2019, Kansas employment grew by only 0.5 percent in 2019, adding approximately 8,000 new jobs to the state economy, but is projected to contract due to novel coronavirus in 2020. The Bureau of Labor Statistics (BLS) still projects the job outlook for biomedical engineers to grow nationally by about the national average of 4% from 2018 to 2028 (OOH-BME, 2020), providing job opportunities for graduates.

Additionally, we expect many professional students in this program to be currently employed. These students will either work on their degree part-time or will take a leave of absence to complete the degree in one year on a full-time basis, and will have almost certain employment (and new internal and/or external opportunities) upon degree completion.

VII. Admission and Curriculum

A. Admission Criteria

Applicants will apply to the ME in Engineering and will include a personal statement detailing how this program will support the candidate’s career goal(s), resume, and three letters of recommendation. In addition, the student must meet the requirements below.

- Overall undergraduate GPA: greater than 3.0 (out of 4.0)
- Complete a KU Graduate Application and submit official transcripts from each institution attended
- Bachelor’s degree in engineering, the biological sciences, physical sciences, or a related field from an accredited post-secondary institution

- Have completed the following coursework (*typically completed as part of an undergraduate degree*):
 - Mathematics through differential equations and linear algebra (MATH 220 and MATH 290; or equivalents)
 - One year of calculus-based physics (through PHSX 212, or the equivalent)
 - One course in general chemistry (CHEM 150 or 130, or the equivalent)
 - One course in molecular/cell/human biology (BIOL 100 or BIOL 150, or the equivalent)
 - Additional coursework required for admission vary by program track and will be the same as the track admission requirements for the existing MS degree program. (Please see Attachment 1 for track-specific admission requirements.)
- International students must also meet KU’s English proficiency, visa/I20, and financial support requirements.

B. Curriculum

Students select one of the six tracks for their primary exposure to bioengineering concepts. All the tracks have the same required core courses (total 6 credit hours): C&PE 756 Introduction to Biomedical Engineering, BIOE 800 Colloquium, and BIOE 801 Responsible Conduct of Research in Engineering. The course C&PE 756 Introduction to Biomedical Engineering, permits them to delve into the subject area of their track, but also allows the student to sample the breadth of bioengineering topics across all of the tracks. BIOE 800 Colloquium provides some professional development as well as additional exposure to the breadth of applications in bioengineering. While BIOE 801 Responsible Conduct of Research in Engineering, might seem less relevant for a professional coursework-only Master of Engineering degree, the focus on professional engineering ethics is quite applicable and important for individuals in industry, as well.

ME students work with an advisor familiar with their selected track area to develop a formal plan of study; each track has a track director and affiliated faculty. The student selects from among track courses to construct a comprehensive educational program that (a) takes advantage of the student’s background, (b) builds and demonstrates academic skills, and (c) capitalizes on the strengths of the affiliated faculty. This approach follows a structure common to many of the top Bioengineering/Biomedical Engineering graduate programs nationally.

Beyond the core courses, each track has 9 credit hours of required depth courses focused on the track, and an additional 15 credit hours of breadth courses. However, because of the varied nature of the tracks there are minor variations in core, depth, and breadth requirements between the tracks. (Please see Attachment 2 for track-specific requirements, and Attachment 3 for the master breadth course list)

Year 1: Fall

SCH = Semester Credit Hours

Course #	Course Name	SCH....
C&PE 756	Introduction to Biomedical Engineering	3
BIOE 800	Bioengineering Colloquium	1
BIOE 801	Responsible Conduct of Research in Engineering	1
	Track Depth Course	3
	Track Breadth Course	3
	Track Breadth Course	3

Year 1: Spring

Course #	Course Name	SCH....
BIOE 800	Bioengineering Colloquium	1
	Track Depth Course	3
	Track Depth Course	3
	Track Breadth Course	3
	Track Breadth Course	3

Year 1: Summer

Course #	Course Name	SCH....
	Track Breadth Course	3

Total Number of Semester Credit Hours 30

VIII. Core Faculty (defined by the program based on level of service and activity in the program)

Note: * Next to Faculty Name Denotes Director of the Program, if applicable
 FTE: 1.0 FTE = Full-Time Equivalency Devoted to Program

Program administration will be the responsibility of KU’s current Bioengineering Graduate Program. The MS and PhD degrees in Bioengineering and the proposed ME degree encompass courses and faculty from departments throughout the School of Engineering, the School of Pharmacy, the College of Liberal Arts and Sciences, and the KU Medical Center. No Bioengineering faculty affiliate has a primary appointment in Bioengineering, but each is affiliated with the Bioengineering Graduate Program based on their research areas, their desire to assist in program administration, and their desire to advise Bioengineering graduate students. Service to the Bioengineering program is considered to also be service to the primary department. Thus, the Bioengineering Program pays no salary to affiliated faculty. Administrative salary support is provided for the Bioengineering Director and the Graduate Studies Director, and full salary is provided for the Bioengineering student program coordinator (staff position) by the School of Engineering.

Faculty Name	Rank	Highest Degree	Tenure Track Y/N	Academic Area of Specialization	FTE to Proposed Program
Berkland, Cory	Full Professor	PhD	Y	Chemical & Petroleum Engr Dept	0
Brumberg, Jonathan	Associate Professor	PhD	Y	Speech-Language-Hearing Dept	0
DeKosky, Brandon	Assistant Professor	PhD	Y	Chemical & Petroleum Engr Dept	0
Dhar, Prajna	Associate Professor	PhD	Y	Chemical & Petroleum Engr Dept	0
Fischer, Ken*	Full Professor	PhD	Y	Mechanical Engineering Department	12.8%
Forrest, Laird	Full Professor	PhD	Y	Pharmaceutical Chemistry	0
Friis, Elizabeth	Full Professor	PhD	Y	Mechanical Engineering Department	0
Gehrke, Stevin	Full Professor	PhD	Y	Chemical & Petroleum Engr Dept	7.7%
Hutchison, Justin	Assistant Professor	PhD	Y	Civil, Environmental & Arch Engr	0
Luchies, Carl	Associate Professor	PhD	Y	Mechanical Engineering Department	0
Maletsky, Lorin	Full Professor	PhD	Y	Mechanical Engineering Department	0
McIff, Terence	Full Professor	PhD	Y	Orthopedics & Sports Medicine	0
Nudo, Randy	Full Professor	PhD	Y	Rehabilitation Medicine Department	0
Robinson, Jenny	Assistant Professor	PhD	Y	Chemical & Petroleum Engr Dept	0
Shontz, Suzanne	Associate Professor	PhD	Y	Electrical Engr & Computer Science	0
Soper, Steven	Full Professor	PhD	Y	Chemistry Department	0
Spencer, Paulette	Full Professor	PhD	Y	Mechanical Engineering Department	0

Candan Tamerler	Full Professor	PhD	Y	Mechanical Engineering Department	0
Wilson, Sara	Associate Professor	PhD	Y	Mechanical Engineering Department	0
Yang, Xinmai	Associate Professor	PhD	Y	Mechanical Engineering Department	0

Number of graduate assistants assigned to this program..... 0

IX. Expenditure and Funding Sources (List amounts in dollars. Provide explanations as necessary.)

A. EXPENDITURES	First FY	Second FY	Third FY
Personnel – Reassigned or Existing Positions			
Faculty	0	0	0
Administrators (other than instruction time)	8,348	8,348	8,348
Graduate Assistants	0	0	0
Support Staff for Administration (e.g., secretarial)	12,417	12,417	12,417
Fringe Benefits (total for all groups)	6,230	6,230	6,230
Other Personnel Costs	0	0	0
Total Existing Personnel Costs – Reassigned or Existing	26,995	26,995	26,995
Personnel – New Positions			
Faculty	0	0	0
Administrators (other than instruction time)	0	0	0
Graduate Assistants	0	0	0
Support Staff for Administration (e.g., secretarial)	0	0	0
Fringe Benefits (total for all groups)	0	0	0
Other Personnel Costs	0	0	0
Total Personnel Costs – New Positions	0	0	0
Start-up Costs - One-Time Expenses			
Library/learning resources	0	0	0
Equipment/Technology	0	0	0
Physical Facilities: Construction or Renovation	0	0	0
Other	0	0	0
Total Start-up Costs	0	0	0
Operating Costs – Recurring Expenses			
Supplies/Expenses	0	0	0
Library/learning resources	0	0	0
Equipment/Technology	0	0	0
Travel	0	0	0
Other	0	0	0
Total Operating Costs	0	0	0
GRAND TOTAL COSTS	26,995	26,995	26,995

B. FUNDING SOURCES <i>(projected as appropriate)</i>	Current	First FY (New)	Second FY (New)	Third FY (New)
Tuition / State Funds		39,955	57,436	62,430
Student Fees		2,626	3,774	4,103
Other Sources		0	0	0
GRAND TOTAL FUNDING		42,581	61,210	66,533
C. Projected Surplus/Deficit (+/-) (Grand Total Funding <i>minus</i> Grand Total Costs)		15,586	34,215	39,538

X. Expenditures and Funding Sources Explanations

A. Expenditures

Personnel – Reassigned or Existing Positions

No new resources are required for instruction or to administer this degree program. The current Bioengineering Graduate Program Director, Graduate Studies Director and student program coordinator will administer this degree program, along with the existing Master of Science and Doctoral degree programs in Bioengineering. As such 1/3rd of their salary for Bioengineering administration as described in the “Core Faculty” section of the proposal is assigned to the ME program. All courses are already/currently being offered as part of the existing degree programs.

Personnel – New Positions

No new positions are required for instruction or to administer this degree program.

Start-up Costs – One-Time Expenses

No new resources are required to initiate this degree program.

Operating Costs – Recurring Expenses

No new resources are required for operating costs of this degree program.

B. Revenue: Funding Sources

Funding for the program will be through tuition and student fees (with typically 50% of total student credit hours in Engineering, course fees \$54.70 credit hour). We expect primarily Kansas residents and those qualifying for in-state tuition (\$416.20/credit hour) will be interested in the program. We have conservatively estimated the number of students interested in the program and expect the program to meet KBOR minima requirements for enrollments and graduates within five years of inception.

C. Projected Surplus/Deficit

Our budget estimate indicates the degree program will run a surplus beginning in Year 1.

XI. References

American Society of Engineering Education July 2019 report for the 2017-2018 Academic Year, <https://www.asee.org/documents/papers-and-publications/publications/college-profiles/2018-Engineering-by-Numbers-Engineering-Statistics-UPDATED-15-July-2019.pdf>.

Occupational Outlook Handbook: Biomedical Engineers (OOH-BME, 2020), <https://www.bls.gov/ooh/architecture-and-engineering/biomedical-engineers.htm>

Center for Economic Development and Business Research, Kansas Employment Forecast,
<https://www.cedbr.org/forecast-blog/forecasts-kansas/1696-economic-outlook-kansas-2020-may-revision>

Detailed Admissions Requirements

The application process is similar to many department degrees. Students will apply to the BIOE program for the Master of Engineering degree. The application will include a personal statement, resume, transcripts, and letters of recommendation. The Admissions Committee (five total members and chaired by the Program Director) reviews the applications. Because of the number of applications, not every Admissions Committee member will review all applicant files as a primary reviewer. Each application received primary review by no fewer than 3 members, and in some cases 4 or all 5 members. The Admission Committee members rate the application in several categories and provide comments that provide rationale for the rankings. After they have submitted their ratings and evaluations, they are allowed to see the ratings/evaluations of the other committee members. After reviews are all complete, the committee meets to discuss each application, and even members who are not primary reviewers provide input to the decision for admission or denial. Decisions are then communicated to the students.

Students accepted into the program must fulfill the standard admission requirements of the University of Kansas Graduate School. In addition, the student must meet the requirements below.

- Overall undergraduate GPA: greater than 3.00 (out of 4.0)
- Personal statement detailing how this program will support the candidate's career goal(s)
- Bachelor's Degree from an accredited post-secondary institution
- Applicants for the Master of Engineering degree. should have a baccalaureate degree in engineering, the biological sciences, physical sciences, or a related field.

In addition, the student must meet the requirements below.

- *General Coursework:*
 - ∞ Mathematics through differential equations and linear algebra (MATH 220 and MATH 290; or equivalents)
 - ∞ One year of calculus-based physics (through PHSX 212, or the equivalent)
 - ∞ One course in general chemistry (CHEM 150 or 184, or the equivalent)
 - ∞ One course in molecular/cell/human biology (BIOL 100 or BIOL 150, or the equivalent)
- Three letters of recommendation
- For applicants with degrees from non-USA institutions:
 - TOEFL – Scores commensurate with Graduate School requirements, or
 - IELTS – Scores commensurate with Graduate School requirements

In addition the following tracks have additional track-specific minimum undergraduate preparation (entrance) requirements.

Biomaterials & Tissue Engineering Track

One of the following three options:

1. Science of Materials: ME 306 or equivalent or ME 765 (as part of the graduate program)
2. Organic Chemistry or Biochemistry: CHEM 310/330, or equivalent (5)*.
3. Cell Biology: BIOL 150 or equivalent*

*BIOL 807 (as part of the graduate program) can satisfy both criterion 2 & criterion 3

Biomechanics & Neural Engineering Track

1. Statistics: MATH 365/465 (or equivalent) (3)
2. All of the following a-c or d:
 - a. Statics: ME 211 (or equivalent)
 - b. Dynamics: ME 320 (or equivalent)
 - c. Mechanics of Materials: ME 311/CE 310 (or equivalent) (3)
 - d. or ME 633 Basic Biomechanics (as part of the graduate program)
3. Science of Materials: ME 306 (or equivalent) (3);
or ME 765 Biomaterials (can be as part of the graduate program) (3)
4. Computer Programming: ME 208/EECS 138/CPE 121 (or equivalent) (3).
5. Circuits/Electronics: EECS 316 & EECS 318 (or equivalent) (3)
or Instrumentation: ME 455 (or equivalent) (3)

Biomedical Product Design & Development Track

1. Science of Materials: ME 306 (or equivalent) (3);
or ME 765 Biomaterials (can be as part of the graduate program) (3).
2. Computer Programming: ME 208/EECS 138/CPE 121 (or equivalent) (3).
3. Engineering Design: ME 501, CPE 613, EECS 501 (or equivalent) (3).
4. One of the following three options:
 - Statics, Dynamics and Mechanics of Materials: ME 211, CE 201, ME 320, ME 311,
CE 310 (or equiv.) or ME 633 (as part of grad program)
 - Circuits/Electronics Lab: EECS 316, EECS 318 or equiv. (3)
 - Fluids: ME 510, CPE 511, or equiv. (3) OR ME 756 (as part of grad program)

Computational Bioengineering Track

1. Programming Language: EECS 268 or equivalent (3)
2. One of the following four options:
 - a. Data Structures: EECS 560 or equivalent (3)
 - b. Statistics: MATH 65 or equivalent (3)
 - c. Numerical Methods/Scientific Computing: MATH 581, EECS 639 or equivalent (3)
 - d. Applied PDEs: MATH 647 or equivalent (3)

**KU BIOENGINEERING
GRADUATE PROGRAM**
The University of Kansas

**Master of Engineering in Bioengineering
Track: Bioimaging**

Proposed for students entering Fall 2021 and beyond

Track Director: Xinmai Yang, Ph.D. (xmyang@ku.edu)

CORE	6 hours required
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CPE 756	Intro to Bioengineering (3)
BIOE 800	Bioengineering Colloquium (.5) (2 total hours req)
BIOE 801	Responsible Conduct of Research in Engineering (1)

DEPTH	9 hours minimum
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PHSL 801-8	Anatomy and Physiology (1-4)
PHSL 848	Fundamentals of Biomedical Imaging (3)
ME 752	Acoustics
ME 754	Biomedical Optics
ME 758	Physiological Systems
EECS 639	Introduction to Scientific Computing (3)
EECS 721	RF Engineering/Antennas (3)
EECS 731	Introduction to Data Science (3)
EECS 739	Parallel Scientific Computing (3)
EECS 740	Digital Image Processing (3)
EECS 644	Intro to Digital Signal Processing (3)
EECS 744	Digital Signal Processing (3)
EECS 781	Numerical Analysis I (3)
EECS 782	Numerical Analysis II (3)
EECS 868	Mathematical Optimization with Applications (3)
EECS 869	Information Theory and Coding (3)
CPE 778	Applied Optimization Techniques (3)
BIOL 943	Multivariate Data Analysis (3)

BREADTH	15 hours minimum
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Choose appropriate courses from the Master Breadth Course List.

MINIMUM HOURS REQUIRED FOR DEGREE: 30

No more than 3 classes may be taken at the 500-600 level and counted towards the graduate degree.

Master of Engineering in Bioengineering
Track: Biomaterials & Tissue Engineering

Proposed for students entering Fall 2021 and beyond

Track Director: Candan Tamerler, Ph.D. (ctamerler@ku.edu)

CORE	6 hours required
CPE 756	Intro to Bioengineering (3)
BIOE 800	Bioengineering Colloquium (.5) (2 total hours req)
BIOE 801	Responsible Conduct of Research in Engineering (1)
DEPTH	9 hours required
1. Advanced Engineering (2 course min)	
ME 765	Biomaterials (3)
ME 767	Molecular Biomimetics (3)
ME 854	Continuum Mechanics of Soft Tissues (3)
ME 990	Advanced Biomaterials (3)
CPE 715	Drug Delivery (3)
CPE 715	Polymer Science & Technology (3)
CPE 751	Basic Rheology (3)
CPE 752	Tissue Engineering (3)
ME 790	Biomedical Microdevices (3)
2. Advanced Biological Sciences (1 course max)	
ANAT 845 / BIOL 560	Histology (3)
MICR 808 / BIOL 503	Immunology (3)
MICR 825 / BIOL 512	Virology (3)
BIOL 612	Fundamentals of Microbiology (3)
BIOL 546	Mammalian Physiology (4)
BIOL 752	Cell Biology (3)
PHCH 860	Principles & Practice of Chemical Biology (3)
BREADTH	15 hours minimum
1. Math; Statistics; Numerical Methods (1 course min)	
2. Sciences (1 course min)	
3. Advanced Engineering (1 course min)	

MINIMUM HOURS REQUIRED FOR DEGREE: 30

No more than 3 classes may be taken at the 500-600 level and counted towards the graduate degree.

KU BIOENGINEERING GRADUATE PROGRAM

The University of Kansas

Master of Engineering in Bioengineering Track: Biomechanics & Neural Engineering

Proposed for students entering Fall 2021 and beyond

Track Director: Terence McIff, Ph.D. (tmciff@kumc.edu)

CORE	6 hours required
CPE 756	Intro to Bioengineering (3)
BIOE 800	Bioengineering Colloquium (.5) (2 total hours req)
BIOE 801	Responsible Conduct of Research in Engineering (1)

DEPTH	9 hours required
1. Mechanics (2 course min)	
ME 633	Basic Biomechanics (3)
ME 722	Modeling Dynamics of Mechanical Systems (3)
ME 750	Biomechanics of Human Motion (3)
ME 751	Exp. Methods in Biomechanics (3)
ME 753	Bone Biomechanics (3)
ME 755	Computer Simulation in Biomechanics
ME 757	Biomechanical Systems (3)
ME 760	Biomedical Product Design (3)
ME 765	Biomaterials (3)
ME 854	Continuum Mechanics for Soft Tissues (3)
CPE 751	Basic Rheology (3)

2. Physiology/Computing/Signal Processing (1 course max)	
ME 758	Physiological System Dynamics (3)
HSES 810	Advanced Exercise Physiology (3)
PHSL 800 or above	
EECS 639	Introduction to Scientific Computing (3)
EECS 739	Parallel Scientific Computing (3)
EECS 868	Mathematical Optimization with Applications (3)
EECS 644	Intro to Digital Signal Processing (3)
EECS 744	Digital Signal Processing (3)
EECS 861	Random Signals & Noise (3)

BREADTH	15 hours minimum
<i>Choose appropriate courses from the Master Breadth Course List.</i>	
1. Advanced Engineering (700 or above) (1 course minimum)	
2. Life Sciences (1 course minimum)	
3. Math, Statistics, Numerical Methods (1 course minimum)	

MINIMUM HOURS REQUIRED FOR DEGREE: 30

No more than 3 classes may be taken at the 500-600 level
and counted towards the graduate degree.

Master of Engineering in Bioengineering

Track: Biomedical Product Design and Development

Proposed for students entering Fall 2021 and beyond

Track Co-Directors: Lisa Friis, Ph.D. (lfriis@ku.edu) and Sara Wilson, Ph.D. (sewilson@ku.edu)

CORE	3 hours required
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CPE 756	Intro to Bioengineering - replaced with breadth course
BIOE 800	Bioengineering Colloquium (.5) (2 total hours req)
BIOE 801	Responsible Conduct of Research in Engineering (1)

DEPTH	9 hours required
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1. Fundamental Courses (6 credits)

ME 765 Biomaterials (3)

AND

ME 760 Biomedical Product Design (3)

3. Design (3 credits)

ME 696 Design for Manufacturability (3)

ME 767 Molecular Biomimetics (3)

ME 790 Bioadditive Manufacturing (3)

ME 790 Biomedical Microdevices (3)

CPE 715 Drug Delivery (3)

CPE 715 Polymer Science & Technology (3)

AE 709 Structural Composites (3)

CE 710 Structural Mechanics (3)

EECS 644 Intro to Digital Signal Processing (3)

EECS 721 Antennas (3)

EECS 728 Fiber-Optic Measurement & Sensors (3)

EECS 739 Parallel Scientific Computing (3)

EECS 741 Computer Vision (3)

or other Design course(s) as approved by committee

BREADTH	18 hours minimum
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Choose appropriate courses from the Master Breadth Course List.

1. Math, Statistics, Numerical Methods (1 course minimum)
2. Advanced Engineering (700 or above) (1 course minimum)
3. Sciences (1 course minimum)
4. Management & Business (0 required, 1 course max)

MINIMUM HOURS REQUIRED FOR DEGREE: 30

No more than 3 classes may be taken at the 500-600 level and counted towards the graduate degree.

KU BIOENGINEERING
GRADUATE PROGRAM
The University of Kansas

Master of Engineering in Bioengineering
Track: Biomolecular Engineering

Proposed for students entering Fall 2021 and beyond

Track Director: Prajna Dhar, Ph.D. (prajnadhar@ku.edu)

CORE	6 hours required
CPE 756	Intro to Bioengineering (3)
BIOE 800	Bioengineering Colloquium (.5) (2 total hours req)
BIOE 801	Responsible Conduct of Research in Engineering (1)
DEPTH	6 hours required
1. Advanced Engineering / Pharmaceuticals (1 courses min)	
CPE 701	Numerical Methods (3)
CPE 715	Drug Delivery (3)
CPE 715	Polymer Science & Technology (3)
CPE 731	Transport Phenomenon (3)
CPE 732	Advanced Transport Phenomena (3)
CPE 751	Basic Rheology (3)
ME 767	Molecular Biomimetics (3)
ME 790	Biomedical Microdevices (3)
PHCH 730/731	Biopharmaceuticals & Pharmacokinetics (3)
PHCH 862/863	Pharmaceutical Equilibrium (3)
PHCH 870	Advanced Pharmaceutical Biotechnology (4)
2. Advanced Biological Sciences	
PHCH 860	Principles & Practice of Chemical Biology (3)
CHEM 760	Intro to Chemistry in Biology (3)
MDCM 701	Biomedical Chemistry (3)
ANAT 845 / BIOL 560	Histology (3)
MICR 808 / BIOL 503	Immunology (3)
MICR 825 / BIOL 512	Virology (3)
BIOL 752	Cell Biology (3)
BREADTH	18 hours minimum

Choose appropriate courses with advisor from master list in the following categories:

1. Statistics (1 course min)
2. Sciences (1 course min)
3. Advanced Engineering (1 course min)

MINIMUM HOURS REQUIRED FOR DEGREE: 30

No more than 3 classes may be taken at the 500-600 level and counted towards the graduate degree.

Master of Engineering in Bioengineering
Track: Computational Bioengineering

Proposed for students entering Fall 2021 and beyond

Track Director: Suzanne Shontz, Ph.D. (shontz@ku.edu)

CORE	6 hours required
CPE 756	Intro to Bioengineering (3)
BIOE 800	Bioengineering Colloquium (.5) (2 total hours req)
BIOE 801	Responsible Conduct of Research in Engineering (1)
DEPTH	9 hours required
1. FUNDAMENTALS COURSE (1 course minimum)	
EECS 639	Introduction to Scientific Computing (3)
EECS 730	Introduction to Bioinformatics (3)
EECS 731	Introduction to Data Science (3)
BINF 701	Computational Biology I (5) - cannot take w/ EECS 730
2. ELECTIVE COURSES (1 course minimum)	
BINF 702	Computational Biology II (5)
EECS 660	Fundamentals of Computer Algorithms (3)
EECS 738	Machine Learning (3)
EECS 739	Parallel Scientific Computing (3)
EECS 740	Digital Image Processing (3)
EECS 837	Data Mining (3)
EECS 839	Mining Special Data (3)
ME 751	Experimental Methods in Biomechanics (3)
ME 755	Computer Simulation in Biomechanics (3)
ME 854	Continuum Mechanics for Soft Tissues (3)
ME 861	Theory of the Finite Element Method (3)
EECS 868 or CPE 778	Math Opt w/ Applications or Applied Opt. Methods (3)
CE 861	Finite Element Methods for Solid Mechanics (3)
AE 746	Computational Fluid Dynamics (3)
BIOL 952	Introduction to Molecular Modeling (3)
PRVM 868	Bioinformatics Driven Clinical Research (3)
BIOS/STAT 730	Applied Linear Regression (3)
BIOS/STAT 799	Introduction to Statistical Genomics (3)
BIOS/STAT 823	Introduction to Programming & Applied Stats in R (3)
BREADTH	9 hours required

Choose appropriate courses from the Master Breadth Course List.

1. Math, Statistics, Numerical Methods (1 course minimum)
2. Life Sciences (1 course minimum)
3. Advanced Engineering (700 or above) (1 course minimum)

MINIMUM HOURS REQUIRED FOR DEGREE: 30

No more than 3 classes may be taken at the 500-600 level and counted towards the graduate degree.

MATH, STATISTICS & NUMERICAL METHODS

Math

MATH 590	Linear Algebra (3)
MATH 596	Math in Biomedical Research (3) \diamond
MATH 611	Fourier Analysis of Time Series (3) S*
MATH 646	Complex Variable and Applications (3)
MATH 647	Applied PDEs (3)
MATH 648	Calculus of Variations (3) S
MATH 724	Combinatorial Mathematics (3) F*
MATH 725	Graph Theory (3) S*
MATH 750	Stochastic Adaptive Control (3) S*
MATH 765	Mathematical Analysis (3) F
MATH 766	Mathematical Analysis II (3) S
MATH 790	Linear Algebra II (3) F
MATH 791	Modern Algebra I (3) S
MATH 865	Stochastic Processes I (3) S
PHSX 718	Mathematical Methods of Physical Sci (3) F
PHSX 721	Chaotic Dynamics (3) ***F

Statistics

BIOL 570	Intro to Biostatistics (3) F
BIOL 841	Biometry I (5) F
BIOL 943	Multivariate Data Analysis (3) F*
BIOS 714	Biostatistics - Fund Biostatics I (3) F
BIOS 717	Biostatistics - Fund Biostatics II (3) S
BIOS 720	Biostatistics - Analysis of Variance (3) F
BIOS 730	Biostatistics - Appld Linear Regression (3) F
BIOS 740	Biostatistics - Applied Multivariate Mthds (3) S
BIOS 810	Biostatistics - Clinical Trials (3) S
BIOS 835	Biostatistics - Categorical Data Analysis (3) F
BIOS 840	Biostatistics - Linear Regression (3) F
BIOS 871	Biostatistics - Mathematical Statistics (3) F
BIOS 830	Biostatistics - Experimental Design (3) S
ESPY 710	Introduction to Statistical Analysis (3) F
ESPY 711	Lab for Introduction to Stats Analysis (1) F
MATH 605	Applied Regression Analysis (3) F*
MATH 627	Probability (3) F
MATH 628	Mathematical Theory of Statistics (3) S
MATH 727	Probability Theory (3) F
MATH 728	Statistical Theory (3) S

Numerical Methods

AE 725	Optimization and Structural Design (3) \diamond
AE 746	Computational Fluid Dynamics (3) S
BINF 701	Bioinformatics I (5) F
BINF 702	Bioinformatics II (5) S
CE 861	Finite Element Mthds- Solid Mechanics (3) S
CPE 701	Methods of Chem and Petro Calculations (3) F
CPE 778	Optimization of Engineering Systems (3) S
EECS 639	Introduction to Scientific Computing (3) F
EECS 739	Parallel Scientific Computing (3) S
EECS 781	Numerical Analysis I (3) F

EECS 782	Numerical Analysis II (3) S
EECS 868	Math, Optimization with Applications (3) F\diamond
MATH 591	Applied Numerical Linear Algebra (3) S*
MATH 780	Numerical Analysis of Linear Systems (3)
MATH 783	Applied Numerical Analysis of PDEs (3) S
MATH 881	Adv. Numerical Linear Algebra (3) F
MATH 882	Adv. Numerical Differential Equations (3) S*
ME 702	Mechanical Engineering Analysis (3) F
ME 788	Optimal Estimation (3) F\diamond
ME 860	Adv. Mechanical Engr. Problems
ME 861	Theory of the Finite Element Method (3) F
ME 862	Finite Element Mthd -Transient Analysis (3) S*
ME 961	FEM for Nonlinear Probs in Solid Mech (3) ***

ENGINEERING

All 700 + Engr courses count. Suggested courses include:

AE 709	Structural Composites (3) F*
AE 781	Introduction Adaptive Aerostructures (3) S
CE 710	Structural Mechanics (3) F*
CE 767	Intro to Fracture Mechanics (3) S*
CPE 715	Polymer Science and Technology (3)
CPE 715	Drug Delivery (3) S
CPE 732	Advanced Transport Phenomena II (3) S
CPE 751	Basic Rheology (3) ***S
CPE 752	Tissue Engineering (3)
CPE 778	Applied Optimization Techniques (3) S*
EECS 644	Intro Digital Signal Processing (3) F
EECS 730	Intro to Bioinformatics (3)
EECS 731	Introduction to Data Science (3) F\diamond
EECS 738	Machine Learning (3)
EECS 739	Parallel Scientific Computing (3)
EECS 740	Digital Image Processing (3)
EECS 744	Digital Signal Processing (3) S*
EECS 837	Data Mining (3)
EECS 861	Random Signals & Noise (3) F
ME 722	Modeling Dynamics of Mech. Sys. (3) S*
ME 750	Human Motion Biomechanics (3) F*
ME 751	Experimental Biomechanics (3) ***F
ME 752	Acoustics (3) S*
ME 753	Bone Biomechanics (3) ***S
ME 754	Biomedical Optics (3) S
ME 755	Computer Simulation Biomechanics (3) F*
ME 757	Biomechanical Systems (3) S*
ME 758	Physiological Systems (3) S*
ME 760	Biomedical Product Design (3) S
ME 765	Biomaterials (3) F
ME 767	Molecular Biomimetics (3)
ME 790	Biomedical Microdevices (3) \diamond
ME 854	Continuum Mechanics for Soft Tissues (3) S
ME 890	Research Methods (3) S
ME 990	Advanced Biomaterials (3) F

BIOLOGICAL SCIENCES

ANAT 832	Electron Micro Tec (3)
ANAT 845	Histology (2)
BIOL 503	Immunology (3) F
BIOL 560	Histology (3) S
BIOL 600	Intro to Biochemistry (3)
BIOL 636	Biochemistry I (3) F
BIOL 637	Intro Biochemistry Laboratory (2) F
BIOL 638	Biochemistry II (3) S
BIOL 639	Advanced Biochemistry Laboratory (2) S
BIOL 644	Comparative Animal Physiology (3) F*
BIOL 546	Mammalian Physiology (4)
BIOL 650	Advanced Neurobiology (3) S
BIOL 768	Plant Molecular Biology (3)
BIOL 673	Cell and Mol Neurobiology (3) F*
BIOL 688	Molecular Biology of Cancer (3) F
BIOL 750	Advanced Biochemistry (3) ***S
BIOL 752	Cell Biology (3) F
BIOL 754	Brain Diseases & Neurological Disorders (3)
BIOL 755	Mechanisms of Development (3) ◊
BIOL 757	Carcinogenesis & Cancer Biology (3) ◊
BIOL 772	Gene Expression (3) S
BIOL 775	Chemistry of the Nervous System (3) S*
BIOL 841	Biometry I (3) F
BIOL 895	Human Genetics (3) F
BIOL 918	Modern Biochemical and Biophysical Mthds (4) S
BIOL 943	Multivariate Data Analysis (3) F*
BIOL 952	Intro. Molecular Modeling (3) S*
MICR 808	Immunology (3) S
MICR 812	Molecular Virology & Pathogenesis (2) F
MICR 820	Bact Genes & Pathogens (3) S
MICR 825	Virology (3) S
NURO 710	Advanced Neurobiology (3)***

CHEMISTRY (BIOCHEM, PHARM CHEM, MED CHEM)

CHEM 510	Biological Physical Chemistry (3) F*
CHEM 635	Instrumental Mthds of Analysis (2) S
CHEM 718	Mathematical Mthds in Physical Sciences (3) F
CHEM 720	Fundamentals & Mthds Analyt. Chem (3) F
CHEM 740	Principles of Organic Reactions (3) F
CHEM 742	Spectroscopic Ident of Organic Comp (3) SU
CHEM 750	Intro to Quantum Mechanics (3) F
CHEM 760	Intro to Chemistry in Biology (3) F
CHEM 820	Analytical Separations (3) F
CHEM 824	Spectrochemical Mthds of Analysis (3)***
CHEM 828	Bioanalysis (3) F
CHEM 840	Physical Organic Chemistry (3) S
CHEM 852	Statistical Thermodynamics (3) S
CHEM 856	Molecular Spectroscopy (3)***
MDCM 701	Biomedical Chemistry (3) F
MDCM 703	Advanced Biomedical Chemistry (3) S
MDCM 790	Principles of Drug Design (3) S
MDCM 791	Principles of Drug Disposition (1) S
PHCH 718	Physcl-Chem Prin Solution Dsg Frm (3) S
PHCH 730	Biopharmaceutics & Pharmacokinetics (3) F

PHCH 775	Chemistry of the Nervous System (3) S
PHCH 850	Solid State Stability and Formation (3) ◊
PHCH 860	Principles & Practice in Chem Biol (3) F
PHCH 862	Pharmaceutical Equilibrium (3) F
PHCH 870	Advanced Pharm Biotechnology (4) S*
PHCH 920	Chemical Kinetics (2) S
PHCH 972	Drug Stability (2-4) S
PHCH 974	Adv Topic: FTIR
PHCH 974	Adv Topic: Vaccines
PHCH 976	Adv Topic: Biopharmct & Pharmacokin I (3)

LIFE SCIENCES

GSMC 840	Clinical Observation for Bioengineers (3)
HSES 670	Intro to Biomechanics (3) S
HSES 672	Exercise Physiology (3)
HSES 805	Exp and Analysis – Exercise Phys (3) F*
HSES 810	Advanced Exercise Physiology (3) F*
HSES 825	Skeletal Muscle Physiology (3) S*
HSES 872	Exercise & the Cardiovascular System (3) S*
HSES 910	Biochemistry of Exercise (3) S
PHSL 835	Integrative Physiology of Exercise (3) S*
PHSL 838	Advanced Topics – Fundamentals of Imaging
PHSL 844	Neurophysiology (3) S*
PHSL 846	Advanced Neuroscience (5) SU
PHSL 847	Developmental Neurobiology (2)
PHSL 848	Mol Mechanisms Neurological Disord (3) F*
REHS 862	Cell & Molecular Basis of Rehab (2) F
REHS 884	Motor Control & Learning (3) F ◊
REHS 887	Neurorehabilitation (3) S
REHS 970	Instrumental Analysis of Human Function (3) F

GRADUATE WRITING / ELECTIVE COURSES

SPLH 861	Applications in MATLAB Programming SU
ME 790	Graduate Writing (3) SU
PHCH 705	Writing & Communicating Science (3) S
PTRS 889	Grant Writing (3) S
PRVM 868	Biomed Informatics Driven Clinical Resch S
ENR 701	Entrepreneurship (3)
ENR 702	Financing Your Own Business (3)
ENR 703	Marketing Your Own Business (3)
ENR 704	Launching Your Own Business (3)
ENR 850	Advanced Entrepreneurship (4)

KEY:

S: Spring	* : biannually
F: Fall	*** : Infrequently
SU: Summer	Blue: KUMC Campus
◊: New course	

Please note these are all subject to change without notice.

Some courses outside of engineering may require a permission number from the course department. Contact the professor or the program assistant of that department for a permission number.



WICHITA STATE
UNIVERSITY
Academic Affairs

September 8, 2020

TO: Daniel Archer
Vice President for Academic Affairs
Kansas Board of Regents

FROM: Richard Muma
Executive Vice President, Provost and Professor

REQUEST: Institute Name Change

Request

Wichita State is seeking approval to change the name of its Institute for Interdisciplinary Innovation.

Current

Institute Name: Institute for Interdisciplinary Innovation

Proposed

Name: College of Innovation and Design

The Institute for Interdisciplinary Innovation (III) provides a structure for interdisciplinary degrees, certificates, and other credentials (e.g., badges) to be implemented, awarded, and administered. The III fits within the framework of WSU's innovation university by providing opportunities for faculty across campus to come together in a collaborative environment to develop academic programs and related research and creative projects in support of this effort.

WSU is requesting to change the name of the Institute. The proposed new name is the *College of Innovation and Design*, which builds on the initiative of becoming an innovation-focused campus and is consistent with universities across the country that are establishing Colleges of Innovation. The name change strengthens the linking of academic disciplines to the developing Innovation Campus and reinforces the message that the "Innovation Campus has come to mean a mindset as well as a physical place." The growth and impact of the institute is represented in the name change to college. No state funding is being requested.

If you require further information, please contact me at the telephone number below or email me at richard.muma@wichita.edu. Thank you.



To: Dr. Howard Smith, Provost and Vice President for Academic Affairs
From: Dr. Lynn Murray, KCOB Director of Outreach and Business Engagement
Re: Establishment of the Center for Professional Selling
Date: May 18, 2020

Attached, please find a proposal for the establishment of the Center for Professional Selling (CPS) in the Kelce College of Business to support the recently established Professional Sales Certificate. By creating the CPS, Pittsburg State University will join a nation-wide network of universities that specifically prepare college students for careers in professional sales across the broad spectrum of traditional disciplinary occupations. We believe the CPS will increase enrollment of degree- and non-degree-seeking students, increase revenue through partnerships with local and regional companies, and allow for deeper engagement within our community.

As you will see, the college is not requesting any additional university resources to undertake this initiative. We do request your approval and support to move forward.

Please contact with any questions or concerns.

cc: Dr. Paul W. Grimes, KCOB Dean

FOR IMMEDIATE RELEASE

MEDIA CONTACT: Matt Keith

Email: mkeith@ksbor.org *Direct:* (785) 430-4237

Project Seeks New Ways for Service Members to Earn Credentials

4 organizations receive grants to build career pathways for military members and veterans

Indianapolis – (September 21, 2020) — A coalition of national education and veteran advocacy organizations has announced pilot sites in a new initiative that will help service members and veterans apply their military-based skills and training toward civilian credentials.

The coalition—which comprises five organizations—is supporting the Military Credentialing Advancement Initiative (MCAI). The goal of MCAI is to ensure that the high-quality learning that is gained by service members can be fully recognized, counted toward a credential and scaled at a national level.

Each of the four pilot sites are leveraging one-year grants between \$150,000 and \$200,000. They are using funds to build pathways that will allow service members and veterans—particularly men and women of color—to apply the skills and credentials they gained in service toward continued education and employment as civilians.

The MCAI pilot pathways grant recipients are:

- UWUA Power for America Training Trust Fund
- Indiana Wesleyan University
- Kansas Board of Regents
- Lone Star College

Technical assistance for the grantees will be provided by SOLID, LLC, a leading expert in credentialing of service members and veterans.

Statistics show that, of the roughly 200,000 veterans who enter the civilian workforce each year, only about 50,000 have the credentials they need to land good jobs with family-sustaining wages. Though the Department of Defense and Uniformed Services have taken steps to remedy this, more than 70% of former servicemen and women still must retrain, requalify or start over in education.

This is especially true for service members of color, who make up [43% of the active-duty force](#). One reason is this: More than half of Black, Hispanic and Native American service members are clustered in four occupations that lack clear paths to civilian credentials and jobs: food service, supply administration, combined personnel and administration, and warehousing and equipment handling.

Also, only 57% of veterans say they hold a non-degree credential, and less than 2.5% of active-duty members in 2016 had completed a degree program. These figures show that lack of recognition of learning continues to hamper service members and veterans as they pursue further education and employment.

“The Kansas Board of Regents is excited to participate in the Military Credentialing Advancement Initiative and collaborate with the other partners in building these new credential pathways,” said KBOR President and CEO Blake Flanders. “The Kansas higher education system is a national leader in articulating military service and skills into credit at colleges and universities, and this initiative will enhance our efforts.”

The MCAI pilot sites are supported by a coalition of five organizations:

- The American Legion
- Ascendium Education Group
- Greater Texas Foundation
- Lumina Foundation
- Rockefeller Philanthropy Advisors

Ascendium’s funding will support a detailed evaluation of the pilot initiative as it unfolds over 18 months. The formative evaluation, which will be conducted by an independent research firm, DVP-Praxis, seeks to highlight the lessons MCAI grantees learn as they map military competencies and build new credential pathways.

About MCAI: The Military Credentialing Advancement Initiative (MCAI) seeks to develop new pathways to credentials for service members and veterans. MCAI’s goal is to recommend principles and guidelines that credential providers should follow to ensure that all verified, validated military-based learning counts toward high-quality civilian credentials.

About KBOR: The nine-member Kansas Board of Regents is the governing board of the state’s six universities and the statewide coordinating board for the state’s 32 public higher education institutions (six state universities, one municipal university, nineteen community colleges, and six technical colleges). In addition, the Board administers the state’s student financial aid, adult education, high school equivalency, and career and technical education programs. Private proprietary schools and out-of-state institutions are authorized by the Kansas Board of Regents to operate in Kansas.