Missouri Department of Higher Education

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NEW PROGRAM PROPOSAL FORM

Sponsoring Institution(s): Truman State University

Program Title: Data Science Graduate Certificate

Degree/Certificate: Data Science Graduate Certificate

Options: Not Applicable

Delivery Site(s): Truman State University / Kirksville, MO

CIP Classification: 11.0499

*CIP code can be cross-referenced with programs offered in your region on MDHE's program inventory highered.mo.gov/ProgramInventory/search.jsp

Implementation Date: FALL 2015

Cooperative Partners: Not Applicable

*If this is a collaborative program, form CL must be included with this proposal

AUTHORIZATION:

Dr. Troy Paino / President		4/13/15
Name/Title of Institutional Officer	Signature	Date

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Person to Contact for More Information	Telephone

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STUDENT ENROLLMENT PROJECTIONS

Year	1	2	3	4	5
Full Time	**2**	**3**	**4**	**5**	**6**
Part Time	**18**	**22**	**26**	**35**	**39**
Total	**20**	**25**	**30**	**35**	**40**

Please provide a rationale regarding how student enrollment projections were calculated:

We anticipate significant demand for this program among regional employers – several of whom have already expressed interest in involving their employees. Our hope is to control the growth gradually so that faculty and students can get used to the new, competency-based pedagogy. While it is expected that some students coming directly out of their undergraduate program may elect to complete all five courses in short order (within a semester or academic year), the adult-focused nature of the program makes it more probable that students will stagger their experience, taking maybe two or three courses per term. The self-paced nature of the program, however, makes it possible that students may complete some courses, and move on to other courses, within the confines of a traditional semester or academic year.

Provide a **rationale** for proposing this program, including **evidence of market demand and societal need supported by research**:

The need of the proposed Data Science Certificate is clear. It meets an emerging need in a field that is quickly growing. Studies of the job market indicate that America's higher learning institutions are not producing qualified data scientists fast enough to meet demand. Jobs in this field not only represent an important contribution to the Missouri economy, but also represent an opportunity for

participants to earn gainful employment in a high-paying field. This program also meets a need for working professionals who may wish to pursue advanced training in Computer Science, or a related field, or prepare for further graduate study, but lack the time or the financial resources to commit to a Master's or PhD program at the present time. Such training is particularly well-timed to respond to exigencies created by present economic conditions, affording businesses an opportunity to obtain continuing education for their employees, and affording employees an opportunity for affordable self-advancement. Truman State University is uniquely positioned to offer this opportunity at an affordable cost that will help advance the workforce development needs of businesses throughout the state, but in particular parts of the state not easily reached by the few existing programs in Data Science. Additionally, this program serves as a vital continuing education link for our graduates—many of whom work in industries in which Data Science plays an important role. Those who have not immediately transitioned into a graduate degree, or those who would like to pursue graduate learning at Truman but lack the job flexibility to do so, may continue their Truman education in the field without having to disrupt their workplace or family commitments. This certificate also affords Truman the opportunity to pilot a competency-based initiative on the graduate level, while exploring the strategic expansion of certificate program offerings to meet the lifelong learning needs of its graduates and the surrounding community, as well as to explore and further probe the viability of other degree offerings in Data Science and Computer Science.

Rationale for Addition of a Data Science Certificate

Truman State University

Overview

The Data Science Certificate is proposed as an opportunity for Computer Science graduates to earn advanced experience in the emerging field of Data Science. This experience compliments a growing need in the workplace for individuals capable of managing, analyzing, and interpreting the significance of large volumes of data – often called "big data." The program offers an alternative to an advanced degree in Computer Science, Statistics, or a related field while allowing students the requisite skill development to make a greater contribution to their jobs and to advance in their careers. The proposed program fulfills a distinct need for employees working in fields requiring the handing of such data, including energy, transportation, banking, health care, and general commerce, among others. Because graduates of several of Truman's disciplines ultimately end-up working in fields that benefit from data science, and given the capacity of several Truman faculty who possess a firm understanding of the subject matter, the program is complementary to Truman State University's mission and its desire for lifelong learning by, and support for, its graduates who can add value to their undergraduate degree through enrollment in this certificate.

Audience

The certificate is intended for both recent Truman graduates with the requisite background in computer science, as well as practicing professionals who want to update and enhance their skills, as well as working professionals with the requisite computer background wanting to reorient their career path toward an emerging field. While not immediately portable into a Master's degree, the certificate experience is potentially appealing to those students contemplating a broader graduate experience in Computer Science, Business, Statistics, or similar fields.

Faculty expect those enrolled in the program to bring workplace problems/examples into their class experience, where permitted by the security of their employment, to enrich the program for all participants. The coursework will be offered online and in a largely self-paced, competency-based format, affording students the opportunity to retest for certain competencies until they can demonstrate they have mastered, or demonstrated minimal competency, in course and program objectives. Attendance in the online course by professionals from throughout Missouri, other states, and abroad, is hoped as a result of this format.

Need

The need of the proposed Data Science Certificate is clear. It meets an emerging need in a field that is quickly growing. Studies of the job market indicate that America's higher learning institutions are not producing qualified data scientists fast enough to meet demand. Jobs in this field not only represent an important contribution to the Missouri economy, but also represent an opportunity for participants to earn gainful employment in a high-paying field. This program also meets a need for working

professionals who may wish to pursue advanced training in Computer Science, or a related field, or prepare for further graduate study, but lack the time or the financial resources to commit to a Master's or PhD program at the present time. Such training is particularly well-timed to respond to exigencies created by present economic conditions, affording businesses an opportunity to obtain continuing education for their employees, and affording employees an opportunity for affordable self-advancement. Truman State University is uniquely positioned to offer this opportunity at an affordable cost that will help advance the workforce development needs of businesses throughout the state, but in particular parts of the state not easily reached by the few existing programs in Data Science.

Additionally, this program serves as a vital continuing education link for our graduates—many of whom work in industries in which Data Science plays an important role. Those who have not immediately transitioned into a graduate degree, or those who would like to pursue graduate learning at Truman but lack the job flexibility to do so, may continue their Truman education in the field without having to disrupt their workplace or family commitments.

This certificate also affords Truman the opportunity to pilot a competency-based initiative on the graduate level, while exploring the strategic expansion of certificate program offerings to meet the lifelong learning needs of its graduates and the surrounding community, as well as to explore and further probe the viability of other degree offerings in Data Science and Computer Science.

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PROGRAM CHARACTERISTICS AND PERFORMANCE GOALS

Institution Name Truman State University
Program Name Data Science Graduate Certificate
Date April 1, 2015

(Although all of the following guidelines may not be applicable to the proposed program, please carefully consider the elements in each area and respond as completely as possible in the format below. Quantification of performance goals should be included wherever possible.)

1. Student Preparation

- Any special admissions procedures or student qualifications required for this program which exceed regular university admissions, standards, e.g., ACT score, completion of core curriculum, portfolio, personal interview, etc. Please note if no special preparation will be required.
  To be considered for admission, students must meet the following requirements: (1) Students must complete an application for Graduate Studies as a Graduate Certificate Student. (2) Students must possess a baccalaureate degree from an accredited post-secondary institution (or its international equivalent). (3) Students must have at least a 2.5 cumulative undergraduate GPA or demonstrate sufficient professional experience to prepare them for the proposed field of study. (4) Applicants are encouraged to submit a copy of undergraduate and/or graduate transcripts to demonstrate sufficient preparation at the time of application. Students may not enroll beyond their second course without providing an official transcript. (5) Assessment and enforcement of student qualifications shall be at the discretion of the Graduate Dean or his/her designate.

- Characteristics of a specific population to be served, if applicable.
  Click here to enter text.

2. Faculty Characteristics

- Any special requirements (degree status, training, etc.) for assignment of teaching for this degree/certificate.
  Normal faculty qualifcations, as stipulated by Higher Learning Commission guidelines, would apply. Typically instructors will be in the field of computer science or statistics, but instructors in applied courses may come from disciplines that heavily use data science technologies and methodologies.

- Estimated percentage of credit hours that will be assigned to full time faculty. Please use the term "full time faculty" (and not FTE) in your descriptions here.

It is currently anticipated that all courses will be taught by full-time faculty with interests in the courses offered. However, the hiring of qualified adjunct faculty – particularly in applied area of data science – may be appropriate (and sometimes even advantageous) from time to time.

- Expectations for professional activities, special student contact, teaching/learning innovation.
  This program will be delivered in a competency-based, self-paced format, allowing for students to progress through material at variable speeds. The pedagogy emphasizes the use of high quality online learning objects, combined with online faculty mentoring/coaching, and scheduled opportunities for collaborative work that simulates workplace applications of data science.

3. Enrollment Projections

- Student FTE majoring in program by the end of five years.
  The program aims to have a pilot year with maximum enrollment per course of 20 students. Over the course of the first five years we hope to gradually increase the number of students completing each course by at least five students per year.

- Percent of full time and part time enrollment by the end of five years.
  Because this is a certificate program, is self-paced, and many of the anticipated students are already in the workplace, it is likely that nearly 100% of students will be enrolled on a part time basis.

4. Student and Program Outcomes

- Number of graduates per annum at three and five years after implementation.
  30 in year three; 40 in year five.

- Special skills specific to the program.
  Participants in this certificate program will be able to: understand how the techniques of data science are used to solve real-world problems in an applied area; use data mining tools and algorithms to solve real-world problems; use machine learning tools and algorithms to solve real-world problems; use data visualization tools and algorithms to find and present patterns hidden in real-world datasets; create coherent, unified, usable datasets from disparate, incomplete, dirty, and massive data sources.

- Proportion of students who will achieve licensing, certification, or registration.
  Not applicable.

- Performance on national and/or local assessments, e.g., percent of students scoring above the 50th percentile on normed tests; percent of students achieving minimal cut-scores on criterion-referenced tests. Include expected results on assessments of general education and on exit assessments in a particular discipline as well as the name of any nationally recognized assessments used.
  70% of students will achieve a rating of "competency" or higher (grade of at least a B under traditional marking schemes).

- Placement rates in related fields, in other fields, unemployed.
  It is anticipated that the bulk of participants in this program will already have some field-relevant employment. However, for students who do not presently have such employment, we would anticipate a placement right of approximately 90%.

- Transfer rates, continuous study.
  As the program is a graduate certificate, we do not anticipate students will elect to transfer these credits purposefully into another certificate program.

5. Program Accreditation

- Institutional plans for accreditation, if applicable, including accrediting agency and timeline. **If there are no plans to seek specialized accreditation, please provide a rationale.**
  Not applicable.

6. Alumni and Employer Survey

- Expected satisfaction rates for alumni, *including timing and method of surveys.*
  Students will be surveyed upon the completion of each course, as well as at the conclusion of their program. Alumni and employers will be contacted to complete a survey three and five years out from the completion of the student's coursework. Survey questions will be focused on assessing the applicability of learning to the workplace environment and perceptions of program effectiveness in preparing students for the tasks of the workplace.

- Expected satisfaction rates for employers, including timing and method of surveys.
  We hope to achieve satisfaction rates in excess of 80% in the three and five-year surveys, understanding that response rates on these surveys tend to be fairly low the longer you get out from the program.

7. Institutional Characteristics

- Characteristics demonstrating why your institution is particularly well-equipped to support the program.
  Truman has a strong undergraduate program in Computer Science, and is home to several faculty with a particular interest and expertise in Data Science. Contributors in other disciplines, including statistics and health professions are numerous. A significant number of

alumni are placed in businesses who benefit from data science skills. Consequently, they provide a consistent source of feedback on employer needs, creating a vital knowledge loop for retooling and improving the curriculum.

PROGRAM STRUCTURE

A. Total credits required for graduate certificate: **15**

B. Residency requirements, if any: **15**

C. General education: Total credits: **15**

Courses (specific courses OR distribution area and credits):

Course Number	Credits	Course Title
CS 510/510G	3	Introduction to Data Science
CS 512/512G	3	Data Visualization
CS 514/514G	3	Data Mining and Machine Learning
CS 516/516G	3	Big Data Analytics
****	****	**** One application area course from the list below. Course list will be expanded to represent additional sub-fields.****
CS 520/520G	3	Healthcare Analytics

D. Major requirements: Total credits: **Not Applicable**

Course Number	Credits	Course Title

E. Free elective credits:

Not Applicable
(Sum of C, D, and E should equal A.)

F. Requirements for thesis, internship or other capstone experience:

Not Applicable

G. Any unique features such as interdepartmental cooperation:

While the program is presently designed using only courses from Computer Science, it is envisioned that the elective category will be expanded to include contributions from Statistics and other relevant disciplines.