

0. Form NP – New Program Proposal Form

**NEW PROGRAM PROPOSAL FORM**

Sponsoring Institution(s): Northwest Missouri State University

Program Title: Data Sciences

Degree/Certificate: Bachelor of Science

Options: Computer Science Track

Business Track

Molecular Biology Track

GIS Track

Delivery Site(s): Maryville Campus

CIP Classification: 27.9999 (Please provide a CIP code)

Implementation Date: Fall 2016

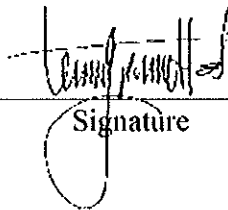
Cooperative Partners: N/A

Expected Date of First Graduation: Spring 2018

**AUTHORIZATION**

Timothy Mottet, Provost

Name/Title of Institutional Officer



Signature

June 1, 2015

Date

Gregory Haddock, Vice Provost

Person to Contact for More Information

(660) 562-1145

Telephone

1. Need (Form SE - Student Enrollment Projections)

Student Demand:

i. Estimated enrollment each year for the first five years for full-time and part-time students (Please complete Form SE.)

<i>Year</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Full-time</i>	<u>10</u>	<u>15</u>	<u>20</u>	<u>25</u>	<u>30</u>
<i>Part-time</i>	_____	_____	_____	_____	_____
<i>Total</i>	<u>10</u>	<u>15</u>	<u>20</u>	<u>25</u>	<u>30</u>

ii. Will enrollment be capped in the future?

There are no plans to cap this program.

What method(s) or data were used to project student enrollment for this proposed program?

After reviewing several schools' programs, the curriculum committee, consisting of faculty from the disciplines: computer science, mathematics and statistics, business, biology, and GIS, concurred with the Harvard Data Science program recommendations that the following be included in data science coursework:

1. Wrangle the data (gather, clean, and sample data to get a suitable data set).
2. Manage the data in a way that gives you access to big data quickly and reliably.
3. Explore the data so you can generate a hypothesis.
4. Make predictions using statistical methods such as regression and classification.
5. Communicate the results using visualization, presentations, and interpretable summaries.

The proposed courses for the data science core address all five of these recommendations. For example, the Introduction to Data Science course includes gathering, cleaning, and managing the data while the data mining course covers generating hypotheses and using statistical methods. The data visualization course addresses communicating the results using visualization.

A. Market Demand:

. National, state, regional, or local assessment of labor need for citizens with these skills  
The National Research Center for College University Admissions (NRCCUA), is a national firm that gauges high school student demand for majors at 4-year colleges. Their listing of major options does not offer an option for data science.

1. Need (Form SE - Student Enrollment Projections)

Therefore, I have provided counts for two groupings that have the closest relation, computer science/information systems and mathematics/statistics. Out of the 2015 high school graduates who were surveyed, 2,450 of the 80,000 or 3.07% indicated an interest in one of these two areas.

As part of Noel-Levitz's Secondary Data Demand Analysis there were 14 new programs that were tested among prospective students. Of the programs tested, Data Science ranked #13 as the program that would be "Very Appealing". Specifically, 23% of the students categorized it as Very Appealing. When surveying the recruiters about the level of interest from high school students in Data Science, they responded saying no students have inquired about a major in either Data Science or Data Analytics.

The ACT National student database indicates that of the 2014 high school graduates, in the 4-state region with an 18-36 ACT composite score, 555 students indicated interest in the majors of Data Management, Information Science, Mathematics, Applied Mathematics, Management Quantitative Methods or Statistics. This volume represents .61% of the 90,000 test takers.

<u>Major ACT Headcount</u>	
<u>Business/Management Quant. Methods</u>	<u>149</u>
<u>Data Management Technology</u>	<u>18</u>
<u>Information Science</u>	<u>37</u>
<u>Mathematics, General</u>	<u>194</u>
<u>Applied Mathematics</u>	<u>98</u>
<u>Statistics</u>	<u>59</u>
<u>NRCCUA Headcount</u>	
<u>Mathematics/Statistics</u>	<u>1,056</u>
<u>Computer Science/Information Systems</u>	<u>1,398</u>

B. Societal Need:

i. General needs which are not directly related to employment

"On the one hand, data is increasingly plentiful and easy to store, transfer, and analyze. On the other hand, this is an increasingly technical task, requiring skills in statistics, computer science, and communication."

Data scientists are in high demand. A McKinsey Global Institute report estimates that by 2018, "the United States alone could face a shortage of 140,000 to 190,000 people with deep analytical skills as well as 1.5 million managers and analysts with the know-how to use the analysis of big data to make effective decisions." That's the sweet spot for data scientists. "Practitioners with strong programming skills who can build and interpret mathematical models, and communicate the results in a meaningful way have a promising future in any arena."

C. Methodology used to determine "B" and "C" above.

While a variety of terms are used in the labor market to describe potential careers for graduates with this type of major, research indicates employment

1. Need (Form SE - Student Enrollment Projections)

opportunities are plentiful and growing. According to the Occupational Outlook Handbook, candidates will be expected to possess exceptional skills in complex problem solving, mathematics, critical thinking, active listening, judgment/decision making, reading comprehension, systems evaluation, writing, operations analysis and systems analysis.

The Bureau of Labor Statistics employment projections suggest a much faster than average growth (potential of 27 percent) from 2012 to 2022. With technological advances, companies will seek efficiencies and cost savings causing the demand for operations research analysis to grow.

A sampling of employers currently seeking full-time "data science" employees and interns within our Kansas City/Omaha/Des Moines triangle include St. Luke's Health Care System, DST Systems, Garmin International, DuPont, Cerner, Mosiac (formerly Hearst land Health in St. Joseph), VML, Federal Reserve Bank, Sprint, ConAgra Foods and Burns & McDonnell While a graduate's chosen emphasis will obviously guide his employment targets, this list of employers potentially touches all curricular options.

## 2. Duplication and Collaboration: (Form CL – Collaborative Programs)

If similar programs currently exist in Missouri, what makes the proposed program necessary and/or distinct from the others at public institutions, area vocational technical schools, and private career schools?

The data science program, if established at Northwest, would be the first undergraduate program of its kind in the state of Missouri. Also, of all the 41 comparable institutions that are benchmarked by Northwest, only Northern Kentucky University has such a program and it was established two years ago. Their enrollment now stands at 30 students. There are about 17 undergraduate data science programs in the US. However, at the graduate level, there are over 150 programs.

Does delivery of the program involve a collaborative effort with any external institution or organization?

No (If yes, please complete Form CL.)

3. Program Structure: (Form PS - Program Structure)

**PROGRAM STRUCTURE**

A. Total credits required for graduation: 124

B. Residency requirements, if any: N/A

C. General education: Total credits: 42

Courses (specific courses OR distribution area and credits):

12 credits that are directed general education and institutional requirements courses:

<u>MATH 17-114 General Statistics.....</u>	<u>3</u>
<u>CIS 44-130 Computers and Information Technology.....</u>	<u>3</u>
<u>PHIL 39-275 Intro to Professional Ethics.....</u>	<u>3</u>
<u>ECON 52-150 General Economics 1.....</u>	<u>3</u>

D. Major requirements: Total credits: 61 to 70 cr., depending on choice of track

Required Courses: (40 credits)

<u>CSIS 44-155 Introduction to Data Science &amp; Data Mining.....</u>	<u>3</u>
<u>MATH 17-120 Calculus I.....</u>	<u>4</u>
<u>MATH 17-215 Discrete Mathematics.....</u>	<u>3</u>
<u>MATH 17-316 Linear Statistical Models I.....</u>	<u>3</u>
<u>MATH 17-318 Linear Statistical Models II.....</u>	<u>3</u>
<u>MATH 356/611 Data Mining with Applications to Bus &amp; Sci.....</u>	<u>3</u>
<u>CSIS 44-141 Computer Programming I.....</u>	<u>3</u>
<u>CSIS 44-241 Computer Programming II.....</u>	<u>3</u>
<u>CSIS 44-413 Visualization.....</u>	<u>3</u>
<u>CSIS 44-317 Management Information Systems.....</u>	<u>3</u>
<u>CSIS 44-460 Database Systems.....</u>	<u>3</u>
<u>MGMT 54-313 Principles of Management.....</u>	<u>3</u>
<u>MKTG 55-330 Principles of Marketing.....</u>	<u>3</u>

Students must choose one track from the following:

Computer Science Track 21 Credit Hours

<u>CSIS 44-242 Data Structures.....</u>	<u>3</u>
<u>CSIS 44-560 Advanced Databases.....</u>	<u>3</u>
<u>CSIS 44-411 Systems Analysis and Design.....</u>	<u>3</u>
<u>CSIS 44-418 IT Project Management.....</u>	<u>3</u>

### 3. Program Structure: (Form PS - Program Structure)

<u>CSIS 44-563 Developing Web Applications and Services.....</u>	<u>3</u>
<u>CSIS 44-517 New course- Big Data (Hadoop, No SQL, cloud computing) ....</u>	<u>3</u>
<u>CSIS 44- 520 New course- Web Mining .....</u>	<u>3</u>

#### Business Track 30 Credit Hours

<u>ACCT 51-201 Accounting I.....</u>	<u>3</u>
<u>ACCT 51-202 Accounting II.....</u>	<u>3</u>
<u>FIN 53-311 Business Law I .....</u>	<u>3</u>
<u>ECON 52-151 Economics II.....</u>	<u>3</u>
<u>FIN 53-324 Fundamentals of Business Finance .....</u>	<u>3</u>
<u>MGMT 54-315 Operations Management .....</u>	<u>3</u>
<u>MGMT 54-417 Organizational Policy and Decision-Making.....</u>	<u>3</u>
<u>MKTG 55-438 International Business.....</u>	<u>3</u>
<u>ECON 52-458 Forecasting Business Conditions.....</u>	<u>3</u>

#### Molecular Biology Track 25 Credit Hours

##### Directed General Education courses:

<u>04-106/107 Principles of Biology &amp; Lab.....</u>	<u>4</u>
<u>24-114/115 General Chemistry I &amp; Lab.....</u>	<u>4</u>

##### Required Courses:

<u>24-116/117 General Chemistry II &amp; Lab.....</u>	<u>5</u>
<u>04-140 General Microbiology &amp; Lab OR .....</u>	<u>4</u>
<u>04-310 Cell Biology &amp; Lab .....</u>	<u>4</u>
<u>24-342/343 Organic Chemistry I &amp; Lab.....</u>	<u>5</u>
<u>04-350 Genetics &amp; Lab .....</u>	<u>4</u>
<u>04-511 Biotechniques &amp; Lab OR .....</u>	<u>4</u>
<u>04-440 Molecular Biology &amp; Lab .....</u>	<u>4</u>
<u>04-454 New course in Bioinformatics .....</u>	<u>3</u>

#### GIS Track 24 Credit Hours

<u>GEOG 32-201 Maps and Map Interpretation.....</u>	<u>3</u>
<u>GEOG 32-362 Cartography.....</u>	<u>3</u>
<u>EOG 32-363 Remote Sensing.....</u>	<u>3</u>
<u>EOG 32-365 GIS.....</u>	<u>3</u>
<u>GEOG 32-465 Introduction to Customized GIS.....</u>	<u>3</u>

3. Program Structure: (Form PS - Program Structure)

<u>GEOG 32-562 Digital Cartography and Geovisualization .....</u>	<u>3</u>
<u>GEOG 32-563 Digital Image Processing.....</u>	<u>3</u>
<u>GEOG 32-565 Advanced GIS.....</u>	<u>3</u>

E. Free elective credits: 2 to 21 cr. depending on course of track (Sum of C, D, and E should equal A.)

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

The Data Mining with Applications to Bus & Science course is common to all track choices and serves as a culminating program experience.

G. Any unique features such as interdepartmental cooperation:

N/A



5. Program Characteristics and Performance Goals: (Form PG).

**PROGRAM CHARACTERISTICS AND PERFORMANCE GOALS**

Institution Name: Northwest Missouri State University

Program Name: B.S. in Data Sciences

Date: June 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.)

**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.

None anticipated or required, however it is typical that students majoring in mathematics have an average to above average ACT subscore in the area.

- Characteristics of a specific population to be served, if applicable.

The ability to market this directly to upcoming HS graduates will be limited due to the new nature of this discipline area. However, efforts will be in place to market this to students deciding majors and happen to have strong analytical, mathematical, and technical ability.

**Faculty Characteristics**

- Any special requirements (degree status, training, etc.) for assignment of teaching for this degree/certificate.

Faculty will be properly credentialed with masters level or terminal degrees in computing, mathematics, GIS, natural sciences, and business.

- 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.

100% full-time faculty anticipated

- Expectations for professional activities, special student contact, teaching/learning innovation.

There are expectations for professional development in this new field including conferences and workshops for faculty.

## 5. Program Characteristics and Performance Goals: (Form PG).

### Enrollment Projections

- Student FTE majoring in program by the end of five years.  
Expectation is up to 30 FTE students majoring in this program at five years
- Percent of full time and part time enrollment by the end of five years.  
FTE is based on full-time enrollment. Part-time will be possible, but enrollment projects will not be based on part-time students

### Student and Program Outcomes

- Number of graduates per annum at three and five years after implementation.  
10 graduate per year at three years, 15 graduates per year at five years.
- Special skills specific to the program.  
mathematical, computing, and analytical/technical ability is expected skill set.
- Proportion of students who will achieve licensing, certification, or registration.  
N/A
- 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.  
Students majoring in all of the disciplines this program consists of have 50% or higher scoring at the 50% percentile on the nationally normed general education assessment exam.
- Placement rates in related fields, in other fields, unemployed.  
Placement is expected to be close to 100%
- Transfer rates, continuous study.  
Not anticipated.

## 6. Program Accreditation

- Institutional plans for accreditation, if applicable, including accrediting agency and timeline. If there are no plans to seek specialized accreditation, please provide reasons.  
Institution is accredited by HLC, no specialized program accreditation in this area.

### Alumni and Employer Survey

- Expected satisfaction rates for alumni, including timing and method of surveys  
Historic information for undergraduate programs in mathematics and computing are that satisfaction is high, anticipated to match this outcome.

5. Program Characteristics and Performance Goals: (Form PG).

- Expected satisfaction rates for employers, including timing and method of surveys  
Program evaluation in five year reviews shows employers are satisfied.

7. Institutional Characteristics: Please describe succinctly why your institution is particularly well equipped or well suited to support the proposed program.

There are two faculty recently hired (one in mathematics, and one in computer science) that have specialization in data mining and analytics due to their dissertation work and doctoral courses. The areas of business, GIS, and natural sciences have faculty that have analytical and statistical backgrounds and coursework to support the computer science and mathematics faculty.

8. Any Other Relevant Information:

Appendix A - proposed catalog copy

Appendix A: Catalog Copy of program description

<b>Catalog (Current)</b>	<b>Catalog (Proposed)</b>
Major Requirements	Major Requirements
Minor Requirements	Comprehensive Major in Data Sciences and Informatics: B.S.—No Minor Required
Total hours	CIP:
	<p><b>Required Courses</b></p> <p>*MATH 17-114 General Statistics..... 3</p> <p>CSIS 44-155 Introduction to Data Science &amp; Data Mining ..... 3</p> <p>MATH 17-120 Calculus I ..... 4</p> <p>MATH 17-215 Discrete Mathematics ..... 3</p> <p>MATH 17-316 Linear Statistical Models I ..... 3</p> <p>MATH 17-318 Linear Statistical Models II ..... 3</p> <p>MATH 356/611 Data Mining with Applications to Bus &amp; Sci..... 3</p> <p>** CIS 44-130 Computers and Information Technology..... 3</p> <p>CSIS 44-141 Computer Programming I ..... 3</p> <p>CSIS 44-241 Computer Programming II ..... 3</p> <p>CSIS 44-413 Visualization ..... 3</p> <p>CSIS 44-317 Management Information Systems ..... 3</p> <p>CSIS 44-460 Database Systems ..... 3</p> <p>* PHIL 39-275 Intro to Professional Ethics..... 3</p> <p>*ECON 52-150 General Economics I.....3</p> <p>MGMT 54-313 Principles of Management .....3</p> <p>MKTG 55-330 Principles of Marketing ..... 3</p> <p>*This course fulfills a General Education Requirement</p> <p>** CSI 44-130 fulfills the Institutional Requirement for Technology</p> <p><b>Students must choose one track from the following:</b></p> <p><b>Computer Science Track</b> <span style="float: right;"><b>21 Credit Hours</b></span></p> <p>CSIS 44-242 Data Structures ..... 3</p> <p>CSIS 44-560 Advanced Databases ..... 3</p> <p>CSIS 44-411 Systems Analysis and Design ..... 3</p> <p>CSIS 44-418 IT Project Management ..... 3</p> <p>CSIS 44-563 Developing Web Applications and Services ..... 3</p> <p>CSIS 44-517 New course – Big Data (Hadoop, No SQL, cloud computing) ..... 3</p> <p>CSIS 44- 520 New course – Web Mining ..... 3</p> <p><b>Business Track</b> <span style="float: right;"><b>30 Credit Hours</b></span></p> <p>ACCT 51-201 Accounting I ..... 3</p> <p>ACCT 51-202 Accounting II ..... 3</p> <p>FIN 53-311 Business Law I ..... 3</p> <p>ECON 52-151 Economics II ..... 3</p>

Appendix A: Catalog Copy of program description

FIN 53-324 Fundamentals of Business Finance .....	3
MGMT 54-315 Operations Management .....	3
MGMT 54-417 Organizational Policy and Decision-Making .....	3
MKTG 55-438 International Business .....	3
ECON 52-458 Forecasting Business Conditions.....	3
<b>Molecular Biology Track</b>	<b>25 Credit Hours</b>
<i>Directed General Education courses:</i>	
04-106/107 Principles of Biology & Lab.....	4
24-114/115 General Chemistry I & Lab .....	4
<i>Required Courses:</i>	
24-116/117 General Chemistry II & Lab .....	5
04-140 General Microbiology & Lab OR .....	
04-310 Cell Biology & Lab .....	4
24-342/343 Organic Chemistry I & Lab .....	5
04-350 Genetics & Lab .....	4
04-511 Biotechniques & Lab OR .....	
04-440 Molecular Biology & Lab .....	4
04-454 New course In Bioinformatics .....	3
<b>GIS Track</b>	<b>24 Credit Hours</b>
GEOG 32-201 Maps and Map Interpretation.....	3
GEOG 32-362 Cartography .....	3
GEOG 32-363 Remote Sensing .....	3
GEOG 32-365 GIS .....	3
GEOG 32-465 Introduction to Customized GIS .....	3
GEOG 32-562 Digital Cartography and Geovisualization .....	3
GEOG 32-563 Digital Image Processing .....	3
GEOG 32-565 Advanced GIS. ....	3
<b>Minor Requirements</b>	
<b>Total hours</b>	