

New Program Proposal

Date Submitted: 04/22/19 10:00 am

Viewing: **DASCBS : Data Science, Bachelor of Science**

Last edit: 07/08/19 10:32 am

Changes proposed by: schubert

Submitter:	User ID:	schubert	Phone:	575-2264
Program Status	Active			
Academic Level				
Type of proposal	Major/Field of Study			
Select a reason for this new program	Adding New Degree--(LOI 1, Proposal-1)			
Are you adding a concentration?	Yes			
Concentration(s):				

In Workflow

1. ENGR Dean Initial
2. Provost Initial
3. Director of Program Assessment and Review
4. Registrar Initial
5. Institutional Research
6. ENGD Chair
7. ENGR Curriculum Committee
8. ENGR Faculty
9. ENGR Dean
10. ARSC Dean
11. WCOB Dean
12. Global Campus
13. Dean of University Libraries
14. Provost Review
15. University Course and Program Committee
16. Faculty Senate
17. Provost Final
18. Provost's Office-- Documentation sent to System Office
19. Higher Learning Commission
20. Board of Trustees
21. ADHE Initial
22. ADHE Final
23. Provost's Office-- Notification of Approval
24. Registrar Final
25. Catalog Editor Final

Approval Path

1. 05/07/19 12:29 pm
Norman Dennis

- (ndennis): Approved
for ENGR Dean
Initial
2. 05/14/19 12:43 pm
Terry Martin
(tmartin): Approved
for Provost Initial
3. 06/04/19 10:09 am
Alice Griffin
(agriffin): Approved
for Director of
Program
Assessment and
Review
4. 06/05/19 7:12 pm
Lisa Kulczak
(lkulcza): Approved
for Registrar Initial
5. 06/06/19 8:50 am
Gary Gunderman
(ggunderm):
Approved for
Institutional
Research
6. 06/11/19 4:04 pm
Norman Dennis
(ndennis): Approved
for ENGD Chair
7. 06/18/19 10:21 am
Manuel Rossetti
(rossetti): Approved
for ENGR
Curriculum
Committee
8. 06/19/19 10:02 am
Norman Dennis
(ndennis): Approved
for ENGR Faculty
9. 06/19/19 10:02 am
Norman Dennis
(ndennis): Approved
for ENGR Dean
10. 06/19/19 10:11 am
Jeannine Durdik
(jdurdik): Approved
for ARSC Dean

11. 06/21/19 4:07 pm
Karen Boston
(kboston):
Approved for WCOB
Dean
12. 06/24/19 10:10 am
Miran Kang (kang):
Approved for Global
Campus
13. 06/27/19 5:24 pm
Carolyn Allen
(challen): Approved
for Dean of
University Libraries
14. 07/08/19 1:08 pm
Terry Martin
(tmartin): Approved
for Provost Review

Action	Code	Title
Add new	BIOF	Bioinformatics
Add new	BMHI	Biomedical and Healthcare Informatics
Add new	BUDA	Business Data Analytics
Add new	DSST	Data Science Statistics
Add new	CMPA	Computational Analytics
Add new	GSDA	Geospatial Data Analytics
Add new	OPNA	Operations Analytics
Add new	SODA	Social Data Analytics
Add new	SYCA	Supply Chain Analytics
Add new	ACCA	Accounting Analytics

Are you adding a track? No

Are you adding a focused study? No

Effective Catalog Year Fall 2020

College/School Code College of Engineering (ENGR)

Department Code Department of Engineering Dean (ENGD)

Program Code DASCBS

Degree Bachelor of Science

CIP Code 30.3001 - Computational Science.

Program Title

Data Science, Bachelor of Science

Program Delivery

Method

On Campus

Is this program interdisciplinary?

Yes

College(s)/School(s)

College/School Name
College of Engineering (ENGR)
Walton College of Business (WCOB)
Fulbright College of Arts and Sciences (ARSC)

Does this proposal impact any courses from another College/School?

Yes

College(s)/School(s)

College/School Name
Fulbright College of Arts and Sciences (ARSC)
Walton College of Business (WCOB)

What are the total hours needed to complete the program? 120

Program Requirements and Description

Requirements

Requirements for B.S. in Data Science

Each student in Data Science is required to complete 120 hours of coursework including the [University Core](#). To be eligible for graduation, all students must complete at least 60 hours of Data Science (DASC) Core classes at the University of Arkansas, Fayetteville that are required for the degree. Each student in Data Science is also required to complete an additional 20-21 hours (depending on the student's chosen Concentration) of required and elective Concentration courses to meet the requirements for a Concentration to better prepare them for employment or further study in areas such as:

- Accounting Analytics
- Bioinformatics
- Biomedical and Healthcare Informatics
- Business Data Analytics
- Computational Analytics
- Data Science Statistics
- Geospatial Data Analytics

Operations Analytics
 Social Data Analytics
 Supply Chain Analytics

Additional opportunities are available to enhance the educational experience of students in these areas. Students should consult their academic advisor for recommendations.

University Core and General Education

36

[ENGL 1013](#) Composition I (ACTS Equivalency = ENGL 1013)

Choose one of the following:

[ENGL 1033](#) Technical Composition II (ACTS Equivalency = ENGL 1023)

or [ENGL 1023](#) Composition II (ACTS Equivalency = ENGL 1023)

[MATH 2554](#) Calculus I (ACTS Equivalency = MATH 2405)

University Core Science Electives - (two courses with labs)

University Core Fine Arts - 3 credit hours

University Core Humanities - (Students are required to complete [PHIL 3103](#))

[PHIL 3103](#) Ethics and the Professions

Choose one of the following:

[HIST 2003](#) History of the American People to 1877 (ACTS Equivalency = HIST 2113)

[HIST 2013](#) History of the American People, 1877 to Present (ACTS Equivalency = HIST 2123)

[PLSC 2003](#) American National Government (ACTS Equivalency = PLSC 2003)

University Core Social Science Elective - 6 credit hours

[ECON 2143](#) Basic Economics: Theory and Practice (represents 3 of the 9 required credit hours for Social Science elective)

Data Science Required Core

47

DASC 1001	Course DASC 1001 Not Found	(First-Year Program - Introduction to Data Science)
DASC 1104	Course DASC 1104 Not Found	(Programming Languages for Data Science (R, Python))
DASC 1204	Course DASC 1204 Not Found	(Introduction to Object Oriented Programming for Data Science (JAVA))
DASC 2594	Course DASC 2594 Not Found	(Multivariable Math for Data Scientists)
DASC 1222	Course DASC 1222 Not Found	(Role of Data Science in Today's World)
DASC 2103	Course DASC 2103 Not Found	(Data Structures & Algorithms)
DASC 2113	Course DASC 2113 Not Found	(Principles & Techniques of Data Science)
DASC 2203	Course DASC 2203 Not Found	(Data Management & Data Base)
DASC 2213	Course DASC 2213 Not Found	(Data Visualization & Communication (Tableau))
DASC 3103	Course DASC 3103 Not Found	(Cloud Computing & Big Data)
DASC 3203	Course DASC 3203 Not Found	(Optimization Methods in Data Science)
DASC 3213	Course DASC 3213 Not Found	(Statistical Learning)
DASC 4892	Course DASC 4892 Not Found	(Data Science Practicum I)
DASC 4113	Course DASC 4113 Not Found	(Machine Learning)
DASC 4123	Course DASC 4123 Not Found	(Social Problems (Issues) in DASC & Analytics)
DASC 4993	Course DASC 4993 Not Found	(Data Science Practicum II)

Data Science Required Additional Courses

[MATH 2564](#) Calculus II (ACTS Equivalency = MATH 2505)

4

[MGMT 2053](#) Business Foundations

3

Choose from one of these two-course sequences

6

[INEG 2313](#) Applied Probability and Statistics for Engineers I

& [INEG 2333](#) and Applied Probability and Statistics for Engineers II (Applied Probability and Statistics for Engineers II)

-- or --

[STAT 3013](#) Introduction to Probability
& [STAT 3003](#) and [Course STAT 3003 Not Found](#) (Statistical Methods)

Data Science Concentration Courses 20-

21

General Electives 3-4

Total Hours 120

120

Data Science - Accounting Analytics (ACCA) Concentration 21

21

Required Accounting Analytics Concentration Courses (18 credit hours)

[ACCT 2013](#) Accounting Principles

[ACCT 2023](#) Accounting Principles II

[ACCT 3533](#) Accounting Technology

[ACCT 3543 Accounting Analytics](#) [Course ACCT 3543 Accounting Analytics Not Found](#)

[ISYS 4193](#) Business Analytics and Visualization

[ISYS 4293](#) Business Intelligence

Elective Accounting Analytics Concentration Courses (Select 3 credit hours)

[FINN 3013](#) Financial Analysis

[ECON 3033](#) Microeconomic Theory

[ECON 4743](#) Introduction to Econometrics

[ECON 4753](#) Forecasting

[MKTG 3433](#) Introduction to Marketing

[MKTG 3633](#) Marketing Research

Data Science - Bioinformatics (BIOF) Concentration

21

Required Bioinformatics Concentration Courses (9 credit hours)

[BIOL 2533](#) Cell Biology

[BIOL 2323](#) General Genetics

Choose one of the following courses:

[BIOL 3863](#) General Ecology

or [BIOL 3023](#) Evolutionary Biology

Elective Bioinformatics Concentration Courses (Select 12 credit hours)

Note: May not fulfill Concentration electives with all GIS courses

[BIOL 4174](#) Conservation Genetics

[BIOL 4233](#) Genomics and Bioinformatics

[BIOL 480V](#) Special Topics in Biological Sciences (Molecular Phylogenetics)

[BIOL 5153](#) Practical Programming for Biologists

[BIOL 580V](#) Special Topics in Biological Sciences (Meta-Analysis)

[GEOS 3543](#) Geospatial Applications and Information Science

[GEOS 3553](#) Spatial Analysis Using ArcGIS

[GEOS 3563](#) Geospatial Data Mining

[GEOS/ANTH 4553](#) Introduction to Raster GIS

Data Science - Biomedical and Healthcare Informatics (BMHI) Concentration

21

Required Biomedical and Healthcare Informatics Concentration Courses (11 credit hours)

[BMEG 2614](#) Introduction to Biomedical Engineering

[CHEM 1123](#) University Chemistry II (ACTS Equivalency = CHEM 1424 Lecture)

[BIOL 2213](#) Human Physiology (ACTS Equivalency = BIOL 2414 Lecture)

[BMEG 3801](#) Clinical Observations and Needs Finding

Elective Biomedical and Healthcare Informatics Concentration (Select 10 credit hours)

BMEG 4713	Cardiovascular Physiology and Devices
BMEG 4973	Regenerative Medicine
BMEG 4413	Tissue Engineering
BMEG 4403	Biomedical Microscopy
BMEG 4513	Biomedical Optics and Imaging
BMEG 4523	Biomedical Data and Image Analysis
BMEG 4983 Genome Engineering and Synthetic Biology	Course BMEG 4983 Genome Engineering and Synthetic Biology Not Found

Note: Students completing the Biomedical and Healthcare Informatics Concentration must select [CHEM 1103](#) and [PHYS 2054](#) for the University Core Science Electives.

Data Science - Business Data Analytics (BUDA) Concentration

21

Required Business Data Concentration Courses (15 credit hours)

ACCT 2013	Accounting Principles
ACCT 2023	Accounting Principles II
WCOB 1033	Data Analysis and Interpretation
ISYS 4193	Business Analytics and Visualization
ISYS 4293	Business Intelligence

Elective Business Data Analytics Concentration Courses (Select 6 credit hours)

FINN 3043	Principles of Finance
FINN 3013	Financial Analysis
ECON 4743	Introduction to Econometrics
ECON 4753	Forecasting
MKTG 3433	Introduction to Marketing
MKTG 3633	Marketing Research

Data Science - Computational Analytics (CMPA) Concentration

21

Required Computational Analytics Concentration Courses (9 credit hours)

CSCE 3513	Software Engineering
CSCE 4143	Data Mining
CSCE 4613	Artificial Intelligence

Elective Computational Analytics Concentration Courses (Select 12 credit hours)

Note: Other courses from CSCE and/or other concentrations of DASC can also be added to the concentration electives.

CSCE 3213	Cluster Computing
CSCE 4013	Special Topics
CSCE 4133	Algorithms
CSCE 4253	Concurrent Computing
CSCE 4523	Database Management Systems
DASC 4533 Information Retrieval (IR)	Course DASC 4533 Information Retrieval (IR) Not Found
CSCE 4853	Information Security

Data Science - Data Science Statistics (DSST) Concentration

21

Required Data Science Statistics Concentration Courses (12 credit hours)

STAT 3113	Introduction to Mathematical Statistics
STAT 4373	Experimental Design
STAT 4013 Statistical Forecasting and Prediction	Course STAT 4013 Statistical Forecasting and Prediction Not Found
STAT 4333	Analysis of Categorical Responses

Elective Data Science Statistics Concentration Courses (Select 9 credit hours)

STAT 4023 Bayesian MethodsCourse STAT 4023 Bayesian Methods Not FoundSTAT 4033

Nonparametric Statistical Methods

STAT 4043

Sampling Techniques

CSCE 4613

Artificial Intelligence

GEOS 3013

Foundations of Geospatial Data Analysis

GEOS 3543

Geospatial Applications and Information Science

GEOS 3563

Geospatial Data Mining

Data Science - Geospatial Data Analytics (GSDA) Concentration

21

Required Geospatial Data Analytics Concentration Courses (18 credit hours)

GEOS 3543

Geospatial Applications and Information Science

GEOS 3553

Spatial Analysis Using ArcGIS

GEOS 3593

Introduction to Geodatabases

GEOS 3563

Geospatial Data Mining

GEOS 4653

GIS Analysis and Modeling

GEOS 4263 Geospatial Data Science - Sources and CharacteristicsCourse GEOS 4263 Geospatial Data Science - Sources and Characteristics Not Found

Elective Geospatial Data Analytics Concentration Courses (Select 3 credit hours)

GEOS 3023

Introduction to Cartography

GEOS 4133

Radar Remote Sensing

GEOS 3213

Principles of Remote Sensing

GEOS 4503

Advanced Cartographic Techniques & Production

GEOS 4593

Introduction to Global Positioning Systems and Global Navigation Satellite Systems

GEOS/ANTH 4553

Introduction to Raster GIS

Data Science - Operations Analytics (OPNA) Concentration

21

Required Operations Analytics Concentration Courses (12 credit hours)

INEG 2413

Engineering Economic Analysis

INEG 3613

Introduction to Operations Research

INEG 3623

Simulation

INEG 4553

Production Planning and Control

Elective Operations Analytics Concentration Courses (9 credit hours)

Select 6 credit hours from:

INEG 4453

Productivity Improvement

INEG 4543

Facility Logistics

INEG 4633

Transportation Logistics

INEG 4683

Decision Support in Industrial Engineering

INEG 4383

Risk Analysis for Transportation and Logistics Systems

Any SCMT course at the 2000 level or higher from the Supply Chain Analytics Concentration

Select 3 credit hours from:

INEG 4123

Global Engineering and Innovation

INEG 4433

Systems Engineering and Management

INEG 4443

Project Management

Data Science - Social Data Analytics (SODA) Concentration

20

Required Social Data Analytics Concentration Courses (14 credit hours)

SOCI 2013

General Sociology (ACTS Equivalency = SOCI 1013)

SOCI 3303

Social Data and Analysis

SOC1 3301L	Social Data and Analysis Laboratory
SOC1 3313	Social Research
SOC1 4253	Social Impact of Data Analytics
SOC1 3001L	Social Science Data Analytics Lab

Elective Social Data Analytics Concentration Courses (Select 6 credit hours)

GEOS 3013	Foundations of Geospatial Data Analysis
GEOS 3543	Geospatial Applications and Information Science
GEOS 3563	Geospatial Data Mining
GEOS 4513	Introduction to GIS Programming
GEOS 4553	Introduction to Raster GIS
PLSC 3603	Scope and Methods of Political Science
PLSC 4213	Campaigns and Elections
SCWK 4073	Social Work Research and Technology I
SOC1 4183	Social Network Analysis
SOC1 4013	Special Topics in Sociology

Data Science - Supply Chain Analytics (SYCA) Concentration

21

Required Supply Chain Analytics Concentration Courses (18 credit hours)

SCMT 2103	Introduction to Supply Chain Management
SCMT 3613	Supply Management
SCMT 3623	Inventory and Forecasting Analytics
SCMT 3643	International Logistics
SCMT 3443	Transportation and Distribution Management
SCMT 4653	Supply Chain Strategy

Elective Supply Chain Analytics Concentration Courses (Select 3 credit hours)

SCMT 3653	Retail Supply Chain Analysis
SCMT 3633	Behavioral Supply Chain Management
SCMT 4123	Sustainable Logistics and Supply Chain Management
SCMT 4103	Special Topics in Supply Chain Management
SCMT 4633	Transportation Analytics

Any INEG course at the 3000 level or higher from the Operations Analytics Concentration

Data Science B.S.**Eight-Semester Degree Program**

The following section contains the list of courses required for the Bachelor of Science in Data Science degree. Not all courses are offered every semester, so students who deviate from the suggested sequence must pay careful attention to course scheduling and course prerequisites and corequisites. Students wishing to follow the eight-semester degree plan should see the Eight-Semester Degree Policy

(<http://catalog.uark.edu/undergraduatecatalog/academicregulations/eightsemesterdegreecompletionpolicy>) in the Academic Regulations chapter for university requirements of the program. Entering first-year students will be required to participate in selected First-Year Data Science Student Services.

First Year

Units

		Fall	Spring
MATH 2554	Calculus I (ACTS Equivalency = MATH 2405)	4	
ENGL 1013	Composition I (ACTS Equivalency = ENGL 1013)	3	
	University Core Science Elective with Lab	4	
DASC 1001	Course DASC 1001 Not Found (First-Year Program - Introduction to Data Science)	1	
DASC 1104	Course DASC 1104 Not Found (Programming Languages for Data Science (R, Python))	4	

<u>MATH 2564</u> Calculus II (ACTS Equivalency = MATH 2505)	4
Choose one of the following (recommend ENGL 1033):	3
<u>ENGL 1033</u> Technical Composition II (ACTS Equivalency = ENGL 1023)	
<u>ENGL 1023</u> Composition II (ACTS Equivalency = ENGL 1023)	
Select one of the following:	3
<u>HIST 2003</u> History of the American People to 1877 (ACTS Equivalency = HIST 2113)	
<u>HIST 2013</u> History of the American People, 1877 to Present (ACTS Equivalency = HIST 2123)	
<u>PLSC 2003</u> American National Government (ACTS Equivalency = PLSC 2003)	
<u>DASC 1204</u> <u>Course DASC 1204 Not Found</u> (Introduction to Object Oriented Programming (JAVA))	4
<u>DASC 1222</u> <u>Course DASC 1222 Not Found</u> (Role of Data Science in Today's World)	2
Year Total:	16 16

Second Year

Units

FallSpring

<u>DASC 2594</u> <u>Course DASC 2594 Not Found</u> (Multivariable Mathematics for Data Scientists)	4
<u>DASC 2103</u> <u>Course DASC 2103 Not Found</u> (Data Structures & Algorithms)	3
Choose from the first course from one of the following two-course sequences:	3
<u>INEG 2313</u> Applied Probability and Statistics for Engineers I & <u>INEG 2333</u> Applied Probability and Statistics for Engineers II <u>Course INEG 2333 Applied Probability and Statistics for Engineers II Not Found</u>	
<u>STAT 3013</u> Introduction to Probability & <u>STAT 3003</u> Statistical Methods <u>Course STAT 3003 Statistical Methods Not Found</u>	
<u>DASC 2113</u> <u>Course DASC 2113 Not Found</u> (Principles & Techniques of Data Science)	3
University Core Fine Arts	3
<u>MGMT 2053</u> Business Foundations	3
Choose the corresponding second course of the two-course sequence:	3
<u>INEG 2333</u> Applied Probability and Statistics for Engineers II <u>STAT 3003</u> Statistical Methods <u>Course STAT 3003 Statistical Methods Not Found</u>	
<u>DASC 2203</u> <u>Course DASC 2203 Not Found</u> (Data Management & Data Base)	3
<u>DASC 2213</u> <u>Course DASC 2213 Not Found</u> (Data Visualization & Communication (Tableau))	3
Required DASC Concentration Course	3
Year Total:	16 15

Third Year

Units

FallSpring

<u>PHIL 3103</u> Ethics and the Professions	3
<u>DASC 3103</u> <u>Course DASC 3103 Not Found</u> (Cloud Computing & Big Data)	3
Required DASC Concentration Course	3
University Core Science Elective with Lab	4
University Core Social Science Elective	3
<u>DASC 3203</u> <u>Course DASC 3203 Not Found</u> (Optimization Methods in Data Science)	3
<u>DASC 3213</u> <u>Course DASC 3213 Not Found</u> (Statistical Learning)	3
Required DASC Concentration Course	3
<u>ECON 2143</u> Basic Economics: Theory and Practice	3
University Core Social Science Elective	3
Year Total:	16 15

Fourth Year

Units
FallSpring

DASC 4892	Course DASC 4892 Not Found	(Data Science Practicum I)	2
DASC 4113	Course DASC 4113 Not Found	(Machine Learning)	3
DASC 4123	Course DASC 4123 Not Found	(Social Problems (Issues) in Data Science)	3
Elective DASC Concentration Course			3
Elective DASC Concentration Course			3
DASC 4993	Course DASC 4993 Not Found	(Data Science Practicum II)	3
Elective DASC Concentration Course			3
Elective DASC Concentration Course			3
General Elective			3
Year Total:			14 12

Total Units in Sequence: 120

Program Costs

Please see attached DASC budget spreadsheet (Data Science Program 5 Year Budget - v5.xlsx)

Library Resources

Please see attached DASC budget spreadsheet (Data Science Program 5 Year Budget - v5.xlsx)

Instructional

Facilities

This is tentatively planned to be space soon to be vacated and subsequently renovated Fulbright Advising Center in Champions Hall. Preliminary estimate of renovation expenses is attached (Champions Hall Renovation Estimate Phase I for the UoA Data Science Program Proposal v12.doc)

Faculty Resources

The Deans of the Colleges of Engineering, Sam M. Walton College of Business, and the J. William Fulbright College of Arts and Sciences have each committed 2 faculty lines (for a total of 6 faculty lines) over the next 3-4 years. The UAF Administration has been asked for \$500k/year of additional support for the program for faculty and staff resources.

List Existing Certificate or Degree Programs that Support the Proposed Program

Are Similar Programs available in the area?

No

Estimated Student Demand for Program 50

Scheduled Program Review Date 2025-2026

Program Goals and Objectives

Program Goals and Objectives

Program Goals and Objectives

The goal for the University of Arkansas B.S. Data Science Program is to have a program to leverage the State of Arkansas' strengths in data science and analytics including integrating real-world industry-based open-ended challenges for workforce development and education by creating a rigorous Data Science curriculum as a partnership of the UAF College of Engineering (COE), the Walton College of Business (WCOB), and the Fulbright College of Arts and Sciences (FCoAS). The objective of the program is to develop graduates who are prepared for a successful career in data science with an amalgamation of capabilities as described in the Learning Outcomes.

The core curriculum is centered around:

- **Computing and Programming Foundation:** Object Oriented Programming, Data Science lingua franca (R, Python), Programming Algorithms and Paradigms, Data Structures and Databases, Data Processing, and Cloud Computing and Big Data.
- **Statistics and Probability Foundation:** Probability and Statistics, Linear Algebra, Statistical Methods for Data Science, Decision Making, Machine Learning, and Optimization.
- **General Education:** Math, Science, Humanities, Fine Arts, and Social Science.
- **Multidisciplinary Environment:** Technical Composition, Role of Data Science in Today's World, Micro and Macro Economics, General Business, Data Visualization and Communications, and Social Issues in Data Science.
- **Multi-College, Interdisciplinary:** Draw on knowledge from different disciplines analyzes, synthesizes and harmonizes links between disciplines into a coordinated and coherent whole through Core courses and the Mandatory Data Science Practicum.
- **Domain Concentrations:** to provide specific domain expertise to the Data Science core.

Learning Outcomes

Learning Outcomes

University of Arkansas B.S. Data Science Program Outcomes

The UAF B.S. Data Science major will prepare students for a successful career in data science with an amalgamation of capabilities:

1. an ability to use information systems, statistics, and computer science principles and apply state-of-the-art technologies for data representation, data retrieval, data manipulation, data storage, data governance, data security, machine learning, computational analytics, and data analysis and visualization;
2. an ability to develop descriptive, predictive, and prescriptive mathematical and statistical models to provide abstractions of complex systems and organizational problems and to apply computational methods to draw conclusions supported by data;

Learning Outcomes

3. an ability to use foundational knowledge and apply critical thinking skills to problem identification, problem solving, decision making, visualization, and an awareness of societal and ethical impacts;
4. an ability to adapt analytics concepts to interpret and communicate findings and implications to senior decision makers;
5. an ability to work effectively in multidisciplinary teams and transfer findings from one knowledge domain to another; and,
6. an ability to communicate in written, verbal, technical, and non-technical forms.

The Outcomes defined for the Core are complemented by specific outcomes for each of the domain concentrations and all outcomes are mapped to the Core and Concentration courses. The Core curriculum is centered around:

- Computing and Programming Foundation: Object Oriented Programming, Data Science lingua franca (R, Python), Programming Algorithms and Paradigms, Data Structures and Databases, Data Processing, and Cloud Computing and Big Data.
- Statistics and Probability Foundation: Probability and Statistics, Linear Algebra, Statistical Methods for Data Science, Decision Making, Machine Learning, and Optimization.
- General Education: Math, Science, Humanities, Fine Arts, and Social Science.
- Multidisciplinary Environment: Technical Composition, Role of Data Science in Today's World, Micro and Macro Economics, General Business, Data Visualization and Communications, and Social Issues in Data Science.
- Multi-College, Interdisciplinary: Draw on knowledge from different disciplines to analyze, synthesize, and harmonize links between disciplines into a coordinated and coherent whole through Core courses and the Mandatory Data Science Practicum. [1,2]
- Domain Concentrations: [as noted, above].

References

1. Crowe C, Higgins ET. 1997. Regulatory Focus and Strategic Inclination: Promotion and Prevention in Decision Making. *Org Behav Hum Decis Process*. 69: 117–132.
2. Fila, N. D., Purzer, S., Rami, C. 2014. Cultures of Innovation Among Chemical, Civil and Mechanical Engineering Students: A Qualitative Study. 2014 IEEE Frontiers in Education Conference (FIE). October 22-25, 2014.

Description and Justification for this request

Description of request	Justification for request
Proposing a	University of Arkansas – Proposed – B.S. Data Science Program with Concentrations

new program Description in Data request	Justification for request
Science.	<p>The University of Arkansas B.S. Data Science Program came from the recognized need, in Arkansas (and nationally [1] and internationally [2]) for a workforce of trained data scientists for technical, business, social, and operational success. For example:</p> <p>“The future of Arkansas’ economic development is tied to our ability to succeed in data analytics and computing.” – Mike Preston, Executive Director, Arkansas Economic Development Commission</p> <p>“Software Development is totally different now than what it used to be. The best job candidate needs to bring a background in computer science and data analysis, with an understanding of business requirements.” -- Charles Morgan, CEO/Chairman, First Orion and former Chairman / CEO / Co-Founder of Acxiom Corp.</p> <p>“This bold plan utilizes the development of the science of data analytics to cut across the areas of opportunity for economic improvement in Arkansas.” [3] – The Arkansas Science Advisory Committee</p> <p>In addition, in numerous interviews with senior executives for major companies, mid-sized companies, and start-ups by the College of Engineering, the Walton College of Business, and the Fulbright College of Arts & Sciences this was stated as a top need and priority. As a result, the Deans of the three colleges commissioned a multi-college interdisciplinary team to develop a curriculum proposal for a rigorous undergraduate degree (major) in Data Science. And, many of those interviewed are members of the newly created Data Science Advisory Council.</p> <p>From the outset, the major was designed with a core curriculum (“hub”) that all students must take and a set of concentrations (“spokes”) that provide knowledge, proficiency and expertise in specific areas. The “hub and spoke” model was chosen to ensure that all graduates had the rigorous core and then as new concentration needs were identified, they could be seamlessly integrated into the program. The total degree is 120 credit hours including 21 hours of concentration and a two-semester, mandatory, multi-college interdisciplinary Practicum with industry partners for a real-life experience. The current concentrations are: Bioinformatics, Biomedical and Healthcare Informatics, Business Data Analytics, Computational Analytics, Data Science Statistics, Geospatial Data Analytics, Operations Analytics, Social Data Analytics, Supply Chain Analytics. And, specifically, this is a Data Science degree with specializations (the concentrations) for domain knowledge and experience—not a degree of the concentrations with some data science included. It is first and foremost a rigorous Data Science degree.</p> <p>Background</p> <p>This program has been developed by a multi-college, interdisciplinary faculty and administration committee representing the COE, WCOB, and FCoAS. The development process included a survey of over 100 existing undergraduate and undergraduate data science / data analytics degree programs worldwide with a down-selection process to ten programs for detailed review. Committee members reviewed those</p>

Description of request	Justification for request
	<p>programs and previous UAF proposals, minors, works-in-progress, etc., to select two programs for on-site visits. Also, an “Employer Needs Survey” was developed to understand the potential needs for graduates of the program. The curriculum is designed around an 8-semester, 120 credit hour rigorous B.S. degree, a 2-semester 5 credit hour (2 + 3) mandatory multi-college interdisciplinary practicum and nine specialization concentrations (21 credit hours each) to start: Bioinformatics, Biomedical and Healthcare Informatics, Business Data Analytics, Computational Analytics, Geospatial Data Analytics, Data Science Statistics, Operations Analytics, Social Data Analytics, and Supply Chain Analytics. The Committee also reviewed relevant publications from the National Academy of Sciences [1], the National Science Foundation [4], and directional input from a Blue Ribbon Panel report for Governor Asa Hutchinson [3], a survey of the Heartland’s economic needs [5,6], an employer’s analyses of needs [2], and convened a Data Science Advisory Council of senior executives and business leaders to provide further insight and feedback.</p> <p>References</p> <ol style="list-style-type: none"> 1. National Academies of Sciences, Engineering, and Medicine. 2018. Data Science for Undergraduates: Opportunities and Options. Washington, DC: The National Academies Press. https://doi.org/10.17226/25104. 2. Columbus, L. 2017. IBM Predicts Demand for Data Scientists Will Soar 28% by 2020. https://www.forbes.com/sites/louiscolombus/2017/05/13/ibm-predicts-demand-for-data-scientists-will-soar-28-by-2020/#593fd9417e3b 3. Morgan, C., Preston, M. 2017. Recommendations on Advancing the Economic Competitiveness of Data Analytics and Computing in Arkansas. State of Arkansas. https://governor.arkansas.gov/images/uploads/Ark2017_09_REV.pdf 4. National Science Foundation. 2017. 10 Big Ideas for Future NSF Investments. https://www.nsf.gov/about/congress/reports/nsf_big_ideas.pdf 5. DeVol, R., et al. 2018. The American Heartland’s Position in the Innovation Economy. https://8ce82b94a8c4fdc3ea6d-b1d233e3bc3cb10858bea65ff05e18f2.ssl.cf2.rackcdn.com/1a/d6/96e90ae54261883d44891badb54c/the-american-heartlands-position-in-the-innovation-economy.pdf 6. DeVol, R., et al. 2018. How Do Research Universities Contribute to Regional Economies? https://8ce82b94a8c4fdc3ea6d-b1d233e3bc3cb10858bea65ff05e18f2.ssl.cf2.rackcdn.com/da/5d/7d56ea9a46de8d0ab5d0e5159ba5/new-research-universities-contribute.pdf

Upload attachments

[DASC - New Degree - Ltr of Intent.docx](#)

[DASCBS - New Degree - Proposal-1.docx](#)

[Champions Hall Renovation Estimate Phase I for the UoA Data Science Program Proposal v12.xlsx](#)

[Data Science Program 5 Year Budget - v5.xlsx](#)

[DASCBS - New Degree - Appendices.pdf](#)

Reviewer Comments **Terry Martin (tmartin) (05/14/19 12:42 pm):** A couple of items to address. 1) Please update the budget to reflect \$500K from the Provost Office. 2) Please include the renovation of Champions Hall in the budget and who is responsible.

Alice Griffin (agriffin) (05/17/19 8:28 am): The Department of Mathematical Sciences is renumbering STAT 4003 Statistical Methods to STAT 3003 (see Program Requirements).

Alice Griffin (agriffin) (05/17/19 2:09 pm): Uploaded revised Proposal and Appendices documents in consultation with submitter. Renamed documents to match BOT naming convention.

Alice Griffin (agriffin) (05/17/19 4:36 pm): Revised Program Requirements layout in consultation with submitter in order to be more consistent with university catalog format.

Alice Griffin (agriffin) (05/20/19 11:07 am): Attached revised DASC 5 Year Budget and Champions Hall Renovation documentation on behalf of submitter.

Alice Griffin (agriffin) (05/24/19 9:07 am): Replaced BMEG XXXX with BMEG 480V for Genome Engineering in program requirements field and the Appendices document.

Alice Griffin (agriffin) (06/04/19 9:58 am): Changed BMEG 480V course title from Genome Engineering to Genome Engineering and Synthetic Biology in program requirements and on behalf of submitter.

Alice Griffin (agriffin) (06/04/19 10:06 am): Updated Appendices to include the revised course title for BMEG 480V on behalf of submitter.

Lisa Kulczak (lkulcza) (06/05/19 7:11 pm): All courses not found currently in approval process for fall 2020 effective date.

Gary Gunderman (ggunderm) (06/06/19 8:49 am): CIP Code of 30.3001 is appropriate. Current proposals call for two new CIP Code when the 2020 codes come out. One for multidisciplinary data science and one for multidisciplinary data analytics. We should probably adjust this program to one of those codes when they become active in spring 2020.

Alice Griffin (agriffin) (07/02/19 10:09 am): Minor revisions to clean up the proposed program. Grammatical errors only.

Alice Griffin (agriffin) (07/08/19 9:39 am): Changed BMEG 480V to the proposed course number BMEG 4983.

Alice Griffin (agriffin) (07/08/19 9:50 am): Changed the proposed STAT 3023 course number in the eight semester plan to the submitted course number of STAT 3003, renumbered from STAT 4003.

Alice Griffin (agriffin) (07/08/19 10:32 am): Replaced Appendices document with corrected course number for BMEG 4983.

Key: 681