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):

<table>
<thead>
<tr>
<th>Action</th>
<th>Code</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add new</td>
<td>BIOF</td>
<td>Bioinformatics</td>
</tr>
<tr>
<td>Add new</td>
<td>BMHI</td>
<td>Biomedical and Healthcare Informatics</td>
</tr>
<tr>
<td>Add new</td>
<td>BUDA</td>
<td>Business Data Analytics</td>
</tr>
<tr>
<td>Add new</td>
<td>DSST</td>
<td>Data Science Statistics</td>
</tr>
<tr>
<td>Add new</td>
<td>CMPA</td>
<td>Computational Analytics</td>
</tr>
<tr>
<td>Add new</td>
<td>GSDA</td>
<td>Geospatial Data Analytics</td>
</tr>
<tr>
<td>Add new</td>
<td>OPNA</td>
<td>Operations Analytics</td>
</tr>
<tr>
<td>Add new</td>
<td>SODA</td>
<td>Social Data Analytics</td>
</tr>
<tr>
<td>Add new</td>
<td>SYCA</td>
<td>Supply Chain Analytics</td>
</tr>
<tr>
<td>Add new</td>
<td>ACCA</td>
<td>Accounting Analytics</td>
</tr>
</tbody>
</table>

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)

<table>
<thead>
<tr>
<th>College/School Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>College of Engineering (ENGR)</td>
</tr>
<tr>
<td>Walton College of Business (WCOB)</td>
</tr>
<tr>
<td>Fulbright College of Arts and Sciences (ARSC)</td>
</tr>
</tbody>
</table>

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

College(s)/School(s)

<table>
<thead>
<tr>
<th>College/School Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fulbright College of Arts and Sciences (ARSC)</td>
</tr>
<tr>
<td>Walton College of Business (WCOB)</td>
</tr>
</tbody>
</table>

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

---

Program Requirements and Description

Requirements

---

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
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

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>ACTS Equivalency</th>
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</thead>
<tbody>
<tr>
<td>ENGL 1013</td>
<td>Composition I (ACTS Equivalency = ENGL 1013)</td>
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</tr>
<tr>
<td>ENGL 1033</td>
<td>Technical Composition II (ACTS Equivalency = ENGL 1023)</td>
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</tr>
<tr>
<td>or ENGL 1023</td>
<td>Composition II (ACTS Equivalency = ENGL 1023)</td>
<td></td>
</tr>
<tr>
<td>MATH 2554</td>
<td>Calculus I (ACTS Equivalency = MATH 2405)</td>
<td></td>
</tr>
</tbody>
</table>

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:
### Program Management

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Notes</th>
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<tr>
<td><strong>HIST 2003</strong></td>
<td>History of the American People to 1877 (ACTS Equivalency = HIST 2113)</td>
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</tr>
<tr>
<td><strong>HIST 2013</strong></td>
<td>History of the American People, 1877 to Present (ACTS Equivalency = HIST 2123)</td>
<td></td>
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</tbody>
</table>

University Core Social Science Elective - 6 credit hours

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ECON 2143</strong></td>
<td>Basic Economics: Theory and Practice (represents 3 of the 9 required credit hours for Social Science elective)</td>
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</table>

**Data Science Required Core**

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

**Data Science Required Additional Courses**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Notes</th>
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</thead>
<tbody>
<tr>
<td>MATH 2564</td>
<td>Calculus II (ACTS Equivalency = MATH 2505)</td>
<td>4</td>
</tr>
<tr>
<td>MGMT 2053</td>
<td>Business Foundations</td>
<td>3</td>
</tr>
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</table>

Choose from one of these two-course sequences 6

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>INEG 2313 &amp; INEG 2333</td>
<td>Applied Probability and Statistics for Engineers I and Applied Probability and Statistics for Engineers II (Applied Probability and Statistics for Engineers II)</td>
<td>-- or --</td>
</tr>
<tr>
<td>STAT 3013 &amp; STAT 3003</td>
<td>Introduction to Probability and Course STAT 3003 Not Found</td>
<td>Statistical Methods</td>
</tr>
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</table>

**Data Science Concentration Courses** 20-21

General Electives 3-4

Total Hours 120

**Data Science - Accounting Analytics (ACCA) Concentration** 21

**Required Accounting Analytics Concentration Courses** (18 credit hours)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCT 2013</td>
<td>Accounting Principles</td>
<td></td>
</tr>
<tr>
<td>ACCT 2023</td>
<td>Accounting Principles II</td>
<td></td>
</tr>
<tr>
<td>ACCT 3533</td>
<td>Accounting Technology</td>
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</tr>
<tr>
<td>ACCT 3543 Accounting Analytics</td>
<td>Course ACCT 3543 Accounting Analytics Not Found</td>
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</tr>
<tr>
<td>ISYS 4193</td>
<td>Business Analytics and Visualization</td>
<td></td>
</tr>
<tr>
<td>ISYS 4293</td>
<td>Business Intelligence</td>
<td></td>
</tr>
</tbody>
</table>

**Elective Accounting Analytics Concentration Courses** (Select 3 credit hours)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>FINN 3013</td>
<td>Financial Analysis</td>
<td></td>
</tr>
<tr>
<td>ECON 3033</td>
<td>Microeconomic Theory</td>
<td></td>
</tr>
<tr>
<td>ECON 4743</td>
<td>Introduction to Econometrics</td>
<td></td>
</tr>
<tr>
<td>ECON 4753</td>
<td>Forecasting</td>
<td></td>
</tr>
<tr>
<td>MKTG 3433</td>
<td>Introduction to Marketing</td>
<td></td>
</tr>
<tr>
<td>MKTG 3633</td>
<td>Marketing Research</td>
<td></td>
</tr>
</tbody>
</table>

https://nextcatalog.uark.edu/programadmin/
Data Science - Bioinformatics (BIOF) Concentration

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
- **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

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

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

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

https://nextcatalog.uark.edu/programadmin/
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

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 Methods  Course STAT 4023 Bayesian Methods Not Found
- STAT 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

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 Characteristics  Course 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

Required Operations Analytics Concentration Courses (12 credit hours)

- INEG 2413  Engineering Economic Analysis
- INEG 3613  Introduction to Operations Research
- INEG 3623  Simulation

https://nextcatalog.uark.edu/programadmin/
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

Required Social Data Analytics Concentration Courses (14 credit hours)
SOCL 2013  General Sociology (ACTS Equivalency = SOCI 1013)
SOCL 3303  Social Data and Analysis
SOCL 3301L  Social Data and Analysis Laboratory
SOCL 3313  Social Research
SOCL 4253  Social Impact of Data Analytics
SOCL 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
SOCL 4183  Social Network Analysis
SOCL 4013  Special Topics in Sociology

Data Science - Supply Chain Analytics (SYCA) Concentration

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/undergraduateregulations/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

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 2554</td>
<td>Calculus I (ACTS Equivalency = MATH 2405)</td>
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</tr>
<tr>
<td>ENGL 1013</td>
<td>Composition I (ACTS Equivalency = ENGL 1013)</td>
<td>3</td>
</tr>
<tr>
<td>University Core Science Elective with Lab</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>DASC 1001</td>
<td>Course DASC 1001 Not Found (First-Year Program - Introduction to Data Science)</td>
<td>1</td>
</tr>
<tr>
<td>DASC 1104</td>
<td>Course DASC 1104 Not Found (Programming Languages for Data Science (R, Python))</td>
<td>4</td>
</tr>
<tr>
<td>MATH 2564</td>
<td>Calculus II (ACTS Equivalency = MATH 2505)</td>
<td>4</td>
</tr>
</tbody>
</table>

Choose one of the following (recommend ENGL 1033):

- ENGL 1033 Technical Composition II (ACTS Equivalency = ENGL 1023)
- ENGL 1023 Composition II (ACTS Equivalency = ENGL 1023)

Select 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)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>DASC 1204</td>
<td>Course DASC 1204 Not Found (Introduction to Object Oriented Programming (JAVA))</td>
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</tr>
<tr>
<td>DASC 1222</td>
<td>Course DASC 1222 Not Found (Role of Data Science in Today’s World)</td>
<td>2</td>
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**Year Total:** 16 16

### Second Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>DASC 2594</td>
<td>Course DASC 2594 Not Found (Multivariable Mathematics for Data Scientists)</td>
<td>4</td>
</tr>
<tr>
<td>DASC 2103</td>
<td>Course DASC 2103 Not Found (Data Structures &amp; Algorithms)</td>
<td>3</td>
</tr>
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</table>

Choose from the first course from one of the following two-course sequences:

- INEG 2313 Applied Probability and Statistics for Engineers I
- INEG 2333 Applied Probability and Statistics for Engineers II Not Found

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 3013</td>
<td>Introduction to Probability</td>
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<tr>
<td>&amp; STAT 3003 Statistical Methods</td>
<td>Course STAT 3003 Statistical Methods Not Found</td>
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<tr>
<td>DASC 2113</td>
<td>Course DASC 2113 Not Found (Principles &amp; Techniques of Data Science)</td>
<td>3</td>
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</table>

University Core Fine Arts | 3

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>MGMT 2053</td>
<td>Business Foundations</td>
<td>3</td>
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</table>

Choose the corresponding second course of the two-course sequence:

<table>
<thead>
<tr>
<th>Course</th>
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<th>Units</th>
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<tbody>
<tr>
<td>INEG 2333</td>
<td>Applied Probability and Statistics for Engineers II</td>
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</tr>
<tr>
<td>STAT 3003 Statistical Methods</td>
<td>Course STAT 3003 Statistical Methods Not Found</td>
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<table>
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<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>DASC 2203</td>
<td>Course DASC 2203 Not Found (Data Management &amp; Data Base)</td>
<td>3</td>
</tr>
<tr>
<td>DASC 2213</td>
<td>Course DASC 2213 Not Found (Data Visualization &amp; Communication (Tableau))</td>
<td>3</td>
</tr>
</tbody>
</table>

Required DASC Concentration Course | 3

**Year Total:** 16 15

### Third Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHIL 3103</td>
<td>Ethics and the Professions</td>
<td>3</td>
</tr>
</tbody>
</table>
Program Management

9/4/2019

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

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:


- **General Education**: Math, Science, Humanities, Fine Arts, and Social 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.

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#### Learning Outcomes

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<th>Learning Outcomes</th>
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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;

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:


- General Education: Math, Science, Humanities, Fine Arts, and Social 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


Proposing a new program in Data Science.

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:

“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

“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.

“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

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.

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.

Background

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 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.

References


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.