APPROVAL FORM FOR

DEGREE PROGRAMS

MISSISSIPPI STATE UNIVERSITY

NOTE: This form is a cover sheet that must accompany the degree program change proposal. The actual proposal should be prepared in accordance with format requirements provided in the *Guide and Format for Curriculum Proposals* published by the UCCC. Both cover sheet and proposal should be submitted to UCCC Mail Stop 9702 (281 Garner Hall), Phone: 325-9410.

College: Academic Affairs Department:

Contact Person: Drs. Shahram Rahimi & Mohsen Razzaghi
Mail Stop: x7450 and x7132
E-mail: rahimi@cse.msstate.edu; razzaghi@math.msstate.edu

Nature of Change: Add Concentrations **Date Initiated:** 4/23 **Effective Date:** 8/23

Current Degree Program Name: Data Science (Starkville and Distance Campus)
Major: MS **Concentration**: None

New Degree Program Name: Data Science (Starkville and Distance Campus)
Major: MS **Concentration**: General, Manufacturing Analytics, Geospatial Science, Agricultural Autonomy

Summary of Proposed Changes:

Introduce concentrations to the MS DSCI program.

Approved: **Date:**

Mohsen Razzaghi

Digitally signed by Mohsen Razzaghi
DN: cn=Mohsen Razzaghi, o=Mississippi State University, ou=Mathematics and Statistics, email=razzaghi@math.msstate.edu, c=US
Date: 2023.04.12 14:49:54 -05'00'

4/12/23

Department Head

4/12/2023

Department Head

4/18/23

Director of Academic Quality

T.J. Jankun-Kelly

Digitally signed by T.J. Jankun-Kelly
Date: 2023.04.21 13:58:45 -05'00'

Chair, College or School Curriculum Committee

Chair, College or School Curriculum Committee

Kari Babski-Reeves for Jason Ketih

Digitally signed by Kari Babski-Reeves for Jason Ketih
Date: 2023.04.21 14:03:18 -05'00'

Dean of College or School

Dean of College or School

Chair, University Committee on Courses and Curricula

Chair, Graduate Council (if applicable)

Chair, Deans Council

1. Catalog Description

The interdisciplinary Master of Science in Data Science degree program will provide students with a broad training in managing, processing, and extracting value from a giant and diverse data sets and allow them to communicate their findings. The program will prepare students for professional employment in industry, government, and NGOs and at the same time obtain sufficient skills to continue into more advanced degree programs. Admission to the Master's program in Data Science is open to graduates from all disciplines with a strong quantitative background and computational skills. The program of study is a blend of statistical and optimization methodology laced with data management and computational skills, and it provides graduate students with the opportunity to participate in data analytics projects. Discipline-specific concentrations allowed depth into specific domains.

2. Graduate Degree Curriculum Outline

Italics indicate deletions; **bold** indicates additions.

CURRENT Degree Description		PROPOSED Degree Description	
Degree: Master of Science (Non-Thesis) Major: Data Science		Degree: Master of Science (Non-Thesis) Major: Data Science **Concentrations: General, Manufacturing Analytics, Geospatial Science, Agricultural Autonomy**	
The interdisciplinary Master of Science in Data Science degree program will provide students with broad training in managing, processing, and extracting value from a giant and diverse data sets and allow them to communicate their findings. The program will prepare students for professional employment in industry, government, and NGOs and at the same time obtain sufficient skills to continue into more advanced degree programs. Admission to the Master's program in Data Science is open to graduates from all disciplines with a strong quantitative background and computational skills. The program of study is a blend of statistical and optimization methodology laced with data management and computational skills, and it provides graduate students with the opportunity to participate in data analytics projects.		The interdisciplinary Master of Science in Data Science degree program will provide students with broad training in managing, processing, and extracting value from a giant and diverse data sets and allow them to communicate their findings. The program will prepare students for professional employment in industry, government, and NGOs and at the same time obtain sufficient skills to continue into more advanced degree programs. Admission to the Master's program in Data Science is open to graduates from all disciplines with a strong quantitative background and computational skills. The program of study is a blend of statistical and optimization methodology laced with data management and computational skills, and it provides graduate students with the opportunity to participate in data analytics projects. **Discipline-specific concentrations allowed depth into specific domains.**	
CURRENT CURRICULUM OUTLINE	Required Hours	**PROPOSED CURRICULUM OUTLINE**	Required Hours
CSE 8423 Data Science Concepts and Practice	3	**Degree Core (12 hours):** CSE 8423 Data Science Concepts and Practice	3
ST 8123 Statistical Thinking: Probability Models and Theory of Statistics	3	ST 8123 Statistical Thinking: Probability Models and Theory of Statistics	3
ST 8133 Statistical Modeling	3	ST 8133 Statistical Modeling	3
CSE 6503 Database Management Systems	3	CSE 6503 Database Management Systems	3
CSE 8080 Directed Project in Computer Science	*1-3*		
General Electives *Students will complete 15 hours in approved Data Science electives. Up to 6 hours Directed Individual Studies may count toward the degree.*	*15*	**Capstone (3 hours):** **A committee approved capstone project course, such as a DIS or CSE 8080 Directed Project.**	**3**
		General Concentration **Data Science Electives (15 hours):**	**15**

		Students will complete 15 hours in approved Data Science electives.	
		Manufacturing Analytics Concentration **Concentration Courses (9 hours):** **IE 6673 Reliability Engineering** **IE 6683 Machine Learning with Industrial Engineering Applications** **IE 8623 Advanced Data Analytics for Complex Systems** **Data Science Electives (6 hours):** **Students will complete 6 hours in approved Data Science electives.**	
		Geospatial Science Concentration **Concentration Courses (9 hours):** **GR 6303 Principles of GIS** **GR 6313 Advanced GIS** **GR 6333 Remote Sensing of the Physical Environment** **Concentration Electives (6 hours):** **Six hours of approved Data Science electives, including the following:** **GR 6343 Advanced Remote Sensing** **GR 6353 Geodatabase Systems** **GR 6363 Geographic Information Systems Programming** **GR 8453 Quantitative Methods in Climatology**	 **3** **3** **3** **6**
		Agricultural Autonomy Concentration **Concentration Courses (9 hours):** **ABE 6463 Introduction to Imaging in Biological Systems** **ABE 6900 Robotics for Biological Systems** **CSE 6643 AI Robotics** **Concentration Elective(s) (3 or 6 hours):** **At least three hours (up to six) from the following:** **ABE 6483 Introduction to Remote Sensing Technologies** **ABE 6433 Geospatial Computing for Biological Systems** **ABE 6443 Spectroscopic Sensing in Biological Systems** **Data Science Electives (0 or 3 hours):** **Students will complete up to 3 hours in approved Data Science electives.**	 **3** **3** **3** **3-6** **0-3**

Total Hours	30	Total Hours	30

Applicants to the program will demonstrate a satisfactory grasp of acquired breadth in the courses: Linear Algebra (MA 3113), Calculus II (MA 1723), and Data Structures (CSE 2383), which should be determined by the Graduate Coordinating Committee of the Data Science Program (GCCDS). The Data Structures requirement may be satisfied by completing CSE 6753 Fundamentals of Computing with a grade of B or higher post admittance with permission. Students must have a minimum of 3.00 out of 4.00 Grade Point Average of equivalent. For students that must demonstrate English Proficiency, a minimum score of 550 Paper-Based Test (PBT) or 213 Computer-Based Test (CBT) or 79 Internet-Based Test (iBT) on the Test of English as a Foreign Language (TOEFL) or an International English Language Testing Systems (IELTS) score of 6.5 is required, or by the approval of the GCCDS.

This degree is a 30 credit, courses-only Master's degree; final evaluation will be performed during the Comprehensive oral exam. The Capstone is a final, project-based class to put the data science knowledge into practice. A DIS in the Major professors Department or CSE 8080 will be used for this purpose. The Capstone will include a written and oral report on the work, evaluated by the student's committee.

Electives allow students to focus on a specific domain of data science or its applications and select appropriate classes to support said applications. Currently approved electives are listed below:

CSE 6433 Artificial Intelligence
CSE 6833 Introduction to Algorithms
CSE 8443 Visualization
CSE 8673 Machine Learning
CSE 8833 Algorithms
CSE 9633 Topics in AI
ST 8263 Advanced Regression Analysis
ST 8353 Statistical Computing
ST 8413 Multivariate Statistical Methods
ST 8214 Design and Analysis of Experiments
ABE 6433 Geospatial Computing for Biological Systems
ABE 6443 Spectroscopic Sensing in Biological Systems
IE 6934 Information Systems for Industrial Engineering
IE 8743 Nonlinear Programming
IE 8793 Heuristics in Optimization
IE 6623 Engineering Statistics II
IE 8333 Production Control Systems II
IE 8353 Manufacturing Systems Modeling
Approved CSE 8990 or ST 8990 Special Topics

3. Justification and Student Learning Outcomes

In spring of 2021, the joint Master of Science in Data Science degree was proposed by the Department of Mathematics & Statistics in the College of Arts & Sciences and the Department of Computer Science in the Bagley College of Engineering. This program was approved by the UCCC and IHL to be jointly administered by the two departments (although the official home of the department is in Academic Affairs, because both colleges could not be listed in Banner). The original proposal established the committee overseeing the degree: the Graduate Coordinating Committee of the Data Science Program (GCCDS), and it is this committee that is proposing to now modify the preliminary curriculum approved in 2021.

The MS in Data Science was designed to provide a rigorous graduate-level education for future data scientists. While an applied degree may serve a student population interested in learning the tools of data science and how to marshal them in the context of particular fields and industries, this master's program serves a different population of students: those who want to develop the data science theories and tools used by data analysts and data technicians. As such, the coordinating departments of the degree (Computer Science, Mathematics & Statistics) propose to update the core requirements with new courses that have been approved since the original proposal and add specific concentrations to the degree.

As the original curriculum proposal documents made clear, the addition of concentrations was always intended as the second phase of degree development for this master's program. This proposal begins that process by adding several concentrations in areas we anticipate will serve the highest number of students currently interested in pursuing the academically oriented data science graduate curriculum.

The learning outcomes are:

- Students will be able to apply data science principles and practices relevant to their application. This will be evaluated by their examinations in related courses and their capstone project.
- Students will be able to communicate effectively in a variety of professional contexts. This will be evaluated by their capstone project and comprehensive exam defense.
- Graduates will be prepared to serve in data science development and leadership roles in academia, industry, and government, including possible doctoral studies. This will be evaluated by exit interviews and follow-ups with alumni.

4. Effective Date

Fall 2023

5. Four-Letter Abbreviation

DSCI

6. Letters of Support

See attached.

7. CIP Code

30.7001

MISSISSIPPI STATE UNIVERSITY
JAMES WORTH BAGLEY COLLEGE OF ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Dr.T.J. Jankun-Kelly
Associate Professor & Graduate Coordinator
tjk@cse.msstate.edu

April 11, 2023

To whom it may concern,

On March 27th, 2023, the Graduate Coordinating Committee of the Data Science Program (GCCDS), in accordance to its charter, met to discuss modifications to the Masters in Data Science program (DSCI MS). The committee voted to approve three matters:

- To add concentrations to the MS DSCI program in cooperating with ABE, ISE, and GEO
- To add a Graduate Minor in DSCI
- To add an Thrive-in-Five program for students interested in MS DSCI

Those signed below attended said meeting and approve of these modifications.

Sincerely yours,

T.J. Jankun-Kelly Digitally signed by T.J. Jankun-Kelly
Date: 2023.04.11 13:48:41 -05'00'

T.J. Jankun-Kelly
Graduate Coordinator, DSCI

Mohammad Sepehrifar
Co-Graduate Coordinator, DSCI

Mohammad Sepehrifar Digitally signed by Mohammad Sepehrifar
DN: cn=Mohammad Sepehrifar, o=Mississippi State University, ou=Mathematics and Statistics, email=msepehrifar@math.msstate.edu, c=US
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Jon Woody
Member, GCCDS

Andy Perkins
Member, GCCDS

MISSISSIPPI STATE UNIVERSITY™

COLLEGE OF ARTS & SCIENCES
Office of the Dean

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April 21, 2023

Dear Dr. Perkins and Members of the UCCC,

I write in support of the proposed modifications to the Master of Science in Data Science degree program.

As a graduate program jointly administered by the College of Arts & Sciences and the Bagley College of Engineering, the Master of Science in Data science helps students develop interdisciplinary expertise in data science theory and concepts. The proposed concentrations allow students to specialize further, improving their academic and career preparation in the program, and these additions are fully supported by the College of Arts & Sciences.

Sincerely,

Rick Travis, PhD
Dean, College of Arts & Sciences

From: **DeanAS-Curriculum** curriculum@deanas.msstate.edu
Subject: Re: DSCI MS Modification and Graduate Minor
Date: April 12, 2023 at 4:56 PM
To: Jankun-Kelly, T.J. tjk@cse.msstate.edu
Cc: Travis, Rick rtravis@deanas.msstate.edu, Tschume, Jacob JTschume@math.msstate.edu, Cain, Emily ecain@deanas.msstate.edu

Thank you, Dr. Jankun-Kelly. I am writing on behalf of the A&S CCC, which unfortunately will not meet again before the final UCCC deadline of the semester. However, since Dr. Travis is writing the support letter, we will still review the proposal at our next meeting (4/28) and provide any suggestions the committee has in case the joint BCoE/A&S MS committee would like to incorporate it into any final revisions the UCCC may ask for.

Best,
Melanie

From: Jankun-Kelly, T.J. <tjk@cse.msstate.edu>
Date: Wednesday, April 12, 2023 at 4:31 PM
To: DeanAS-Curriculum <curriculum@deanas.msstate.edu>
Cc: Loehwing, Melanie <mloehwing@deanas.msstate.edu>, Travis, Rick <rtravis@deanas.msstate.edu>
Subject: DSCI MS Modification and Graduate Minor

To whom it may concern,

Please find attached two proposals related to the Graduate Data Science degree shared between A&S and BCoE. One modifies the MS degree to add concentrations (as was the original plan), the other adds a Graduate Minor to the program. BCoE will be reviewing these proposals concurrently for the next UCCC deadline.

Please reach out if you have any questions.

TJK

--
Dr. T.J. Jankun-Kelly
Associate Professor and Director of Graduate Studies, CSE
http://www.cse.msstate.edu/~tjk/ @dr_tj

MISSISSIPPI STATE
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Department of Mathematics & Statistics
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P. 662.325.3414
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www.math.mssrate.edu

Dear Dr. Perkins and Members of the University Committee on Courses and Curricula,

We are writing this letter to express support for the proposed modifications to the DSCI MS program, particularly the addition of new Data Science Concentrations in General, Manufacturing Analytics, Geospatial Science, and Agricultural Autonomy.

As described in the catalog, the interdisciplinary Master of Science in Data Science degree program is designed to provide students with comprehensive training in managing, processing, and extracting insights from large and varied data sets. The program will equip students with the necessary skills to communicate their findings and prepare them for professional employment in industry, government, and NGOs. Moreover, the program offers ample opportunities for students to participate in data analytics projects and continue into more advanced degree programs.

We believe that the addition of these new concentrations will allow students to gain specialized knowledge and expertise in their chosen fields. Furthermore, the program's open admission policy to graduates from all disciplines with a strong quantitative background and computational skills will enable individuals with diverse backgrounds to benefit from this program.

Overall, we strongly support the proposed modifications to the DSCI program and believe that they will help prepare students for the rapidly growing field of data science. Thank you for considering this letter of support.

Sincerely,

Curriculum Committee,
Department of Mathematics and Statistics

---------- Robert Banik

---------- Matt McBride

---------- Chuanxi Qian

---------- Mohammad Sepehrifar

---------- Jon Woody

MISSISSIPPI STATE UNIVERSITY

Department of Agricultural and Biological Engineering
P. O. Box 9632, Mississippi State, MS 39762
Phone: 662.325.3282; Website: abe.msstate.edu

April 11, 2023

RE: Agricultural Autonomy Concentration for the Master of Science in Data Science

Dear Dr Jankun-Kelly,

The purpose of this letter is to express support for adding the Agricultural Autonomy Concentration to the Master of Science in Data Science degree program. The Department of Agricultural and Biological Engineering will provide oversight of that concentration for students who apply to and enroll in that concentration. If you have any questions or need additional information, please let me know.

Sincerely,

J. Alex Thomasson, Ph.D., P.E.
Professor, Department Head, and Berry Endowed Chair

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Department of Geosciences
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355 Lee Blvd.
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Mississippi State, MS 39762
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FAX (662) 325-9423

April 12, 2023

Dear Curriculum Committee chair,

The Department of Geosciences Curriculum Committee reviewed the degree modification proposal where several of our courses (specifically GR 6303, GR 6333, GR 6313, GR 6343, GR 6353, GR 6363, and GR 8453) are being added to the Master of Science in Data Science Geospatial Science concentration. The committee supports the addition of these courses to the program and looks forward to future collaboration with those working in the Data Science program. If you have any questions, please feel free to contact us.

Respectfully,

_____	_____
Andrew Mercer (Committee Chair)	Padmanava Dash (Committee Member)
_____	_____
Christa Haney (Committee Member)	Sarah Lalk (Committee Member)
_____	_____
Rinat Gabitov (Committee Member)	Brian Williams (Committee Member)

Cc: Dr. John C. Rodgers, Department Head of Geosciences

MISSISSIPPI STATE UNIVERSITY™
JAMES WORTH
BAGLEY
COLLEGE OF ENGINEERING

DEPARTMENT OF INDUSTRIAL
& SYSTEMS ENGINEERING

Dr. Kari Babski-Reeves
Professor, Head and Larry G Brown Endowed Professor
kari@ise.msstate.edu

April 11, 2023

RE: Manufacturing Analytics Concentration to the Master of Data Science

Dear Dr Jankun-Kelly,

Please find this letter to be in support of adding the Manufacturing Analytics Concentration in the Master of Data Science degree. ISE will provide oversight of that concentration for students that are apply and enroll in that concentration. If you have any questions or need additional information, please let me know.

Sincerely

Kari Babski-Reeves
Larry G Brown Endowed Professor and Head, Department of Industrial and Systems Engineering
Associate Dean, Bagley College of Engineering