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| For Academic Affairs and Research Use Only | |
| Proposal Number |  |
| CIP Code: |  |
| Degree Code: |  |

**New or Modified Course Proposal Form**

**[X] Undergraduate Curriculum Council**

**[ ] Graduate Council**

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| **[X]New Course, [ ]Experimental Course (1-time offering), or [ ]Modified Course (Check one box)** |

Signed paper copies of proposals submitted for consideration are no longer required. Please type approver name and enter date of approval.

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| Jason L. Causey 10/8/2020 **Department Curriculum Committee Chair** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…  **COPE Chair (if applicable)** |
| Jake A. Qualls 10/8/2020 **Department Chair** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…  **Head of Unit (if applicable)** |
| Jason Stewart 10/8/2020  **College Curriculum Committee Chair** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…  **Undergraduate Curriculum Council Chair** |
| Summer DeProw 9/25/2020 **Office of Assessment (new courses only)** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…  **Graduate Curriculum Committee Chair** |
| Abhijit Bhattacharyya 10/8/2020 **College Dean** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…  **Vice Chancellor for Academic Affairs** |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…  **General Education Committee Chair (if applicable)** |  |

1. **Contact Person (Name, Email Address, Phone Number)**

Jason L. Causey, jcausey@astate.edu, 870-972-3978 ext. 8182

1. **Proposed starting term and Bulletin year for new course or modification to take effect**

Starting Term: Spring 2021. Bulletin Year: 2020-2021.

**Instructions:**

*Please complete all sections unless otherwise noted. For course modifications, sections with a “Modification requested?” prompt need not be completed if the answer is “No.”*

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|  | **Current (Course Modifications Only)** | **Proposed (New or Modified)**  *(Indicate “N/A” if no modification)* |
| **Prefix** |  | **CS** |
| **Number\*** |  | **4623** |
| **Title** |  | **Fundamentals of Data Science** |
| **Description\*\*** |  | **Study of the practices and techniques associated with data science, including programming for data analytics, modern technologies for data access in distributed and parallel systems, and an overview of machine learning models.** |

***\**** (Confirm with the Registrar’s Office that number chosen has not been used before and is available for use. For variable credit courses, indicate variable range. *Proposed number for experimental course is 9*. )

\*\*Forty words or fewer as it should appear in the Bulletin.

1. **Proposed prerequisites and major restrictions** **[Modification requested? Yes/No]**

(Indicate all prerequisites. If this course is restricted to a specific major, which major. If a student does not have the prerequisites or does not have the appropriate major, the student will not be allowed to register).

1. **Yes** Are there any prerequisites?
   1. If yes, which ones?

STAT 3233 and “C” or better in CS 2124 or DATA 2004

* 1. Why or why not?

The material covered by the course requires understanding of advanced computer programming and statistics.

1. **No** Is this course restricted to a specific major?
   1. If yes, which major? Enter text...
2. **Proposed course frequency [Modification requested? Yes/No]**

(e.g. Fall, Spring, Summer; if irregularly offered, please indicate, “irregular.”) *Not applicable to Graduate courses.*

Spring

1. **Proposed course type [Modification requested? Yes/No]**

Will this course be lecture only, lab only, lecture and lab, activity (e.g., physical education), dissertation/thesis, capstone, independent study, internship/practicum, seminar, special topics, or studio? Please choose one.

Lecture only

1. **Proposed grade type [Modification requested? Yes/No]**

What is the grade type (i.e. standard letter, credit/no credit, pass/fail, no grade, developmental, or other [please elaborate])

standard letter

1. **Yes** Is this course dual-listed (undergraduate/graduate)?
2. **No** Is this course cross-listed?

*(If it is, all course entries must be identical including course descriptions. Submit appropriate documentation for requested changes. It is important to check the course description of an existing course when adding a new cross-listed course.)*

**a.** – If yes, please list the prefix and course number of the cross-listed course.

Enter text...

**b.** – **Yes / No** Can the cross-listed course be used to satisfy the prerequisite or degree requirements this course satisfies?

Enter text...

1. **Yes** Is this course in support of a new program?

a. If yes, what program?

Data Science and Data Analytics

1. **No** Will this course be a one-to-one equivalent to a deleted course or previous version of this course (please check with the Registrar if unsure)?

a. If yes, which course?

Enter text...

**Course Details**

1. **Proposed outline** **[Modification requested? Yes/No]**

(The course outline should be topical by weeks and should be sufficient in detail to allow for judgment of the content of the course.)

Week 1-2: Introduction and Data Science Process, Infrastructure and Tools

Week 3: Visualizing Data, Exploratory Data Analysis

Week 4: Linear Algebra Review

Week 5: Statistical Distributions & Probability Review

Week 6: Data Collection & Data Cleaning

Week 7-8: Supervised Learning, communicating and visualizing results from supervised models.

Week 9: Unsupervised Learning, communicating and visualizing results from unsupervised models.

Week 10: Gradient Descent, Neural Networks

Week 11-13: Deep Learning Concepts, Multi-Layer Perceptron, Convolutional Networks, Recurrent Networks, and other contemporary deep architectures.

Week 14: Presenting and communicating data science analyses and results.

Week 15: Scaling Up Analytics-Map Reduce, Spark, Parallel processing.

1. **Proposed special features** **[Modification requested? Yes/No]**

(e.g. labs, exhibits, site visitations, etc.)

Hands-on experience with modern software for data analysis, modeling, and visualization.

1. **Department staffing and classroom/lab resources**

1. Will this require additional faculty, supplies, etc.?

**No**.

The course will be in rotation with the dual-listed graduate course which has been in the rotation for several years. Its addition to the bulletin as a regular course will have no impact on department staffing or resources

1. **No** Does this course require course fees?

*If yes: please attach the New Program Tuition and Fees form, which is available from the UCC website.*

**Justification**

**Modification Justification (Course Modifications Only)**

1. Justification for Modification(s)

Enter text...

**New Course Justification (New Courses Only)**

1. Justification for course. Must include:

a. Academic rationale and goals for the course (skills or level of knowledge students can be expected to attain)

The demand for data science skills from both industry and academia is growing rapidly. This course will equip students with the skills and tools used for data science application development necessary to address this demand.

b. How does the course fit with the mission of the department? If course is mandated by an accrediting or certifying agency, include the directive.

One part of the mission is to maintain the curriculum with updated technologies. The course addresses the department’s ongoing need to add curriculum reflecting new concepts and technologies in computer science. The department needs to prepare students for work and continuing advancement in the industrial application and computing research of data science.

c. Student population served.

Juniors/seniors seeking degrees in the Computer Science program, or in Data Science and Data Analytics program.

d. Rationale for the level of the course (lower, upper, or graduate).

Students should begin this course having comprehensive understanding about statistics, and programming skills.

**Assessment**

**Assessment Plan Modifications (Course Modifications Only)**

1. **Yes / No** Do the proposed modifications result in a change to the assessment plan?

*If yes, please complete the Assessment section of the proposal*

**Relationship with Current Program-Level Assessment Process (Course modifications skip this section unless the answer to #18 is “Yes”)**

1. What is/are the intended program-level learning outcome/s for students enrolled in this course? Where will this course fit into an already existing program assessment process?

Students will attain the   
1) ability to apply knowledge of computing and mathematics appropriate to the discipline.

2) ability to analyze the local and global impact of computing on individuals, organizations, and society.

3) ability to use current techniques, skills, and tools necessary for computing practice.

1. Considering the indicated program-level learning outcome/s (from question #19), please fill out the following table to show how and where this course fits into the program’s continuous improvement assessment process.

*For further assistance, please see the ‘Expanded Instructions’ document available on the UCC - Forms website for guidance, or contact the Office of Assessment at 870-972-2989.*

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| **Program-Level Outcome 1 (from question #19)** | Students will attain the ability to apply knowledge of computing and mathematics appropriate to the discipline. |
| Assessment Measure | Projects and exams will be used as a direct assessment of the outcome; employer surveys will be conducted as well. |
| Assessment  Timetable | Project and exam results will be collected in each offering of the course, reviewed annually, and reported on every three years; employer surveys will be conducted each fall and reported on every four years. |
| Who is responsible for assessing and reporting on the results? | Course instructor in coordination with the department assessment committee. |

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| **Program-Level Outcome 2 (from question #19)** | Students will attain the ability to analyze the local and global impact of computing on individuals, organizations, and society |
| Assessment Measure | Various scenarios with societal and/or ethical impacts will be proposed and students will develop individual and/or group responses to them. Employers will be surveyed for their assessment of students' awareness of these topics and their related professional conduct. |
| Assessment  Timetable | Assessment of scenario responses will be conducted for each offering of the course, reviewed annually and reported on once every three years; employer surveys will be conducted each fall and reported on every four years. |
| Who is responsible for assessing and reporting on the results? | Course instructor in coordination with the department assessment committee. |

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| **Program-Level Outcome 3 (from question #19)** | Students will attain the ability to use current techniques, skills, and tools necessary for computing practice |
| Assessment Measure | Completed projects as well as presentations will be used as a direct assessment of the outcome; employer surveys will be conducted as well. |
| Assessment  Timetable | Project and presentation assessment results will be conducted for each offering of the course, reviewed annually, and reported on once every three years; employer surveys will be conducted each fall and reported on every four years. |
| Who is responsible for assessing and reporting on the results? | Course instructor in coordination with the department assessment committee. |

*(Repeat if this new course will support additional program-level outcomes)*

**Course-Level Outcomes**

1. What are the course-level outcomes for students enrolled in this course and the associated assessment measures

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| **Outcome 1** | Students will be familiar with the software platform for data science. |
| Which learning activities are responsible for this outcome? | In-class discussion and illustrations  Demonstration of analysis results in presentations |
| Assessment Measure | Course presentations, exams and projects |

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| **Outcome 2** | Student will become familiar with techniques for data cleaning and analysis. |
| Which learning activities are responsible for this outcome? | Accomplish related literature reviews  Demonstrate the analysis results in presentations and exams |
| Assessment Measure | Course exams and presentations |

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| **Outcome 3** | Students will gain experience which will develop software implementation skills in a data science context. |
| Which learning activities are responsible for this outcome? | In-class discussion and illustrations  Accomplish related literature reviews  Conduct effective projects |
| Assessment Measure | Course homework, presentations, exams and projects |

*(Repeat if needed for additional outcomes)*

**Bulletin Changes**

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| **Instructions** |
| **Please visit** [**http://www.astate.edu/a/registrar/students/bulletins/index.dot**](http://www.astate.edu/a/registrar/students/bulletins/index.dot) **and select the most recent version of the bulletin. Copy and paste all bulletin pages this proposal affects below. Please include a before (with changed areas highlighted) and after of all affected sections.**  **\*Please note: Courses are often listed in multiple sections of the bulletin. To ensure that all affected sections have been located, please search the bulletin (ctrl+F) for the appropriate courses before submission of this form.** |

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Before:

**CS 4543. Database Systems** Topics include major database models, relational algebra, data

independence and database normalization, entity relationship model, security, integrity, recovery, and

concurrency issues, physical organization of a database. Dual listed with CS 5543. Prerequisite,

CS 3113. Fall.

**CS 4613. Mobile Application Development** Creation of mobile applications for iOS and Android

devices through a project-based environment, deployment of applications to mobile hardware and

effective teamwork. Dual listed with CS 5613. Prerequisite, CS 3113 or instructor permission.

Spring.

**CS 4713. Analysis of Algorithms** Analysis of space and time requirements of algorithms.

Worst case and average case studies. Greedy algorithms and divide and conquer algorithms.

Tractable and intractable algorithms. Dual listed with CS 5713. Prerequisites, CS 3113 and MATH

2214. Fall.

After:

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Spring.

**CS 4623. Fundamentals of Data Science.** Study of the practices and techniques associated with data science, including programming for data analytics, modern technologies for data access in distributed and parallel systems, and an overview of machine learning models. Dual listed with CS 5623. Prerequisites, STAT 3233 and “C” or better in CS 2124 or DATA 2004. Spring.

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