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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)** |
| Abhijit Bhattacharyya 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 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: Fall 2021. Bulletin Year: 2021-2022

**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** |  | DATA |
| **Number\*** |  | 3023 |
| **Title** |  | Data Visualization and Data Communication (Data Vis. & Data Communication) |
| **Description\*\*** |  | Methods and techniques that allow for the visual communication of complex and statistical relationships, including underlying theory and application of current technologies for effective data visualization and data communication for a mass audience. |

***\**** (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?

CS 1114 or CS 2114

* 1. Why or why not?

Students need to understand programming fundamentals to succeed in this course.

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.*

Fall

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. **No** 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?

**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: Introduction to data visualization and data communication. Information visualization. Types of data and the visualization pipeline.

Week 2: Data and image models. The history and techniques for visual display of quantitative information

Week 3: Visualization design for data communication.

Week 4: Exploratory data analysis. How not to lie with statistics?

Week 5: Analysis and visualization of multi-dimensional relational databases. Visualization of big data and relational databases (e.g., Hadoop, SQL, MySQL).

Week 6: Graphical perception. Grammar of Graphics and its layer-based applications (e.g. ggplot2 for R, ggplot for Python).

Week 7: Visualization software. Interactive graphics (e.g., D3.js, Plot.ly, R Shiny, Tableau).

Week 8: Creating and automating dynamic documents (e.g., knitr, Latex, Markdown). Report automation. Table population and automation.

Week 9: Color and information. Colors and Color Codes.

Week 10: Output formats and tradeoffs. Value-by-Area Mapping (e.g., Cartography). Output formats and tradeoffs (e.g., SVG, PS, PDF, PMG, HTML, etc.).

Week 11: Data structures for different output formats (e.g., wide-to-long data, tidy data, time-series data, spatial data). Information visualization for text analysis.

Week 12: Communicating Data to a Mass Audience. Best practices for presentations. Fonts. Document processing. Technical translation for a non-technical audience.

Week 13, 14: Project and Presentation Preparation

Week 15: Project Presentations

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

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

Use of computer software in lab or virtually.

Project Presentations.

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

Computer lab for interacting with visualization software.

1. Will this require additional faculty, supplies, etc.?   
   **No**
2. **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)

**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)

Students will gain skills in data visualization, and learn to communicate data related findings to audiences of varying technical understanding.

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.

Offered by cross-disciplinary program of Data Science/Data Analytics, this course will reinforce the communication skills necessary to contribute to the intellectual and economic development of our region and the wider global society.

c. Student population served.

Undergraduate students majoring in Data Science and Data Analytics.

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

This course is upper-level so that students have learned basic programming skills before registering.

**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?

3) Design and implement a solution to a problem in the realm of data science/data analytics through problem identification, problem solving, decision making, visualization, data analysis and reporting.

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 3 (from question #19)** | Design and implement a solution to a problem in the realm of data science/data analytics through problem identification, problem solving, decision making, visualization, data analysis and reporting. |
| Assessment Measure | Assessed in DATA 4013: Capstone Design. A hierarchical final project review panel consisting of peer, stakeholder, and faculty reviews in a rubric format. Students will complete an exit survey. |
| Assessment  Timetable | Assessment data is gathered at the end of each semester in which the DATA 4013 capstone course is offered; review occurs on an annual basis. |
| Who is responsible for assessing and reporting on the results? | Instructor of record for DATA 4013 directs final project review, collects rubrics from the panel, and collates the results. Program director reviews results and reports to the Program Steering Committee. Program director may recommend changes, to be approved by the Steering Committee, or changes may be recommended by the Steering Committee directly. |

*(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** | Student will design and create an effective data visualization project that is relevant for their domain emphasis. |
| Which learning activities are responsible for this outcome? | Students will learn software, statistical, design, and communication skills that will build upon one another such that they become competent enough to complete the final course paper. |
| Assessment Measure | A review of final course papers that demonstrate competency in data visualization and communication graded by faculty members in rubric format. |

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| **Outcome 2** | Student will identify and appropriate visualization techniques given the requirements of the data and/or technique being applied. |
| Which learning activities are responsible for this outcome? | Students will learn software, statistical, design, and communication skills that will build upon one another such that they become competent enough to achieve this outcome. |
| Assessment Measure | A review of final course papers that demonstrate competency in data visualization and communication graded by faculty members in rubric format. |

**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.** |

From 2020-2021 Undergraduate Bulletin,  
Page 463, before the heading “Digital Design (DIGI)”

Before:

**CS 483V. Internship** Supervised work experience participating in application system development in a business and manufacturing environment. Grade earned will be pass or fail. Prerequisites. Permission of the Computer Science faculty and CS 3113. Irregular.

**Digital Design (DIGI)**

**DIGI 2003. Introduction to Coding with Swift** Foundations in coding using Swift language. Practical application of the tools, techniques, and concepts needed to build a basic iOS app. Fall, Spring.

After:

**CS 483V. Internship** Supervised work experience participating in application system development in a business and manufacturing environment. Grade earned will be pass or fail. Prerequisites. Permission of the Computer Science faculty and CS 3113. Irregular.

**Data Science and Data Analytics (DATA)**

**DATA 2004. Programming for Data Analysis**. Programming techniques and tools with application in scientific and data science/data analytics disciplines. Prerequisite, “C” or better in CS 1114 or CS 2114. Fall, Spring.

**DATA 3003. Applied Database and Data Mining.** Current database query methods, technologies and techniques used in data mining, including topics such as classification, association analysis and cluster analysis. Prerequisites, STAT 3233 and “C” or better in CS 1114. Fall.

**DATA 3011. Data Science and Analytics Seminar.** Introduction to data science and analytics as an academic major with a focus on topics such as emergent and current data science research, the relevant tools and skills, and identifying potential career paths across a variety of fields. Restricted to Data Science and Data Analytics majors. Fall.

**DATA 3023. Data Visualization and Data Communication.** Methods and techniques that allow for the visual communication of complex and statistical relationships, including underlying theory and application of current technologies for effective data visualization and data communication for a mass audience. Prerequisite, CS 1114 or CS 2114. Fall.

**DATA 303V. Internship for Data Science and Data Analytics.** Practical experience in Data Science and Data Analytics working in a government organization, private company or in certain instances, within the university. Prerequisites, CS 1114 or CS 2114, AGST 3503, STAT 3233. Fall, Spring, Summer.

**DATA 4003. Fundamental Concepts in Design of Experiments.** Fundamental concepts in planning and conducting experiments and analyzing the resulting data using a major statistical package. Prerequisite, STAT 3243. Fall.

**DATA 4013. Data Science and Data Analytics Capstone.** Application of the knowledge and skills gained in the Data Science and Data Analytics program. Students will create a project to solve a real-world challenge or provide insights into a scientific research area coordinated with academic, industry, or government partners. Prerequisites, Senior standing and consent of instructor. Fall, Spring.

**Digital Design (DIGI)**

**DIGI 2003. Introduction to Coding with Swift** Foundations in coding using Swift language. Practical application of the tools, techniques, and concepts needed to build a basic iOS app. Fall, Spring.