ACADEMIC AFFAIRS GUIDELINES

Section 2:	Programs and Curriculum	
Title:	Joint Data Science & Engineering Graduate (PhD) Program Administration Guidelines	
Number (Current Format)	Number (Prior Format)	Date Last Revised
2.3.2.6.C(1)	N/A	09/2023
Reference:	AAC Guideline 2.3.2.6.A – Collaborative and Joint Agreement Guidelines	
Related Form(s):		

1. **Purpose**

   The South Dakota Board of Regents (SDBOR) has established a framework within both policy and guidelines to encourage institutions to identify cooperative opportunities that will allow for the sharing of faculty resources, expertise and infrastructure to improve efficiencies and reduce unnecessary duplication.

   The purpose of the Joint Data Science and Engineering Graduate Program is to provide for the common delivery of graduate data science programs (coursework, research, and mentorship) by the South Dakota School of Mines & Technology (Mines) and the University of South Dakota (USD). This joint program builds upon other existing joint programs and shared courses between the participating institutions. Through this collaboration, Mines will contribute content, research training, and faculty with expertise in computer science, math, and multiple fields of engineering. USD will contribute content, research training, and faculty with expertise in computer science, artificial intelligence, math and statistics, medicine and health science, business, and biomedical engineering.

2. **Partners & Institutional Leads**

   2.1. Participating Institutions: South Dakota School of Mines & Technology and the University of South Dakota. South Dakota School of Mines & Technology was approved to offer a Ph.D. program in Data Science & Engineering in May 2022. Instead of delaying the approval process for SDSMT to proceed with a Fall 2022 start, USD did not add onto the approval process originally. After working together during the spring and summer of 2022, Mines and USD faculty agreed that they would like to add USD's medical, biomedical, and business analytics expertise to this degree. USD and SDSMT currently work collaboratively at the graduate and undergraduate level in biomedical engineering. This program at USD will serve students wanting to continue their research at the doctoral level.

   2.2. Each participating institution will identify a designated institutional representative appointed by the Chief Academic Affairs Officer who will be responsible for coordinating activities with the other partner institution pursuant to the terms of this agreement.

   2.3. Changes to the agreement may be made periodically and must be agreed upon by the designated institutional representatives.

3. **Common Assessment Structure**

   3.1. Students will demonstrate that they possess the knowledge associated with graduates of a high-quality graduate Data Science and Engineering PhD program within their specific focus area in the field. They will be tested in their individual courses and in their dissertation or final project defense.

   3.2. Students in the PhD program must satisfy qualifying requirements. The qualifying requirements tests the student's background knowledge and ability to pursue advanced courses and dissertation research. These requirements are managed by the student's committee. Qualifying requirements should be completed within the first 36 credit hours. Changes to the timeline can occur under special circumstances with the approval of the graduate advisory committee. Additional information regarding the qualifying requirements are located in the sample catalog language in the appendix of this document. The qualifying requirements shall be satisfied by completing ONE of the items below:

      3.2.1. Successful completion of an oral or written examination on the student's coursework and general knowledge of the discipline.

      3.2.2. Successful publication of two high impact peer reviewed Journal or Conference papers as approved by the student's graduate committee.

      3.2.3. Successful presentation of two papers in the student's field of study (one seminal paper, and one paper at the boundary of knowledge as indicated by the date of publication being no older than two years from the date of the examination). The student will work with their graduate advisor to discuss and ultimately select the papers for presentation. These presentations could occur at a conference, local seminar, or to the student's committee.

      3.2.4. The successful defense of a master's thesis may be used as the qualifying examination, at the discretion of the student's graduate advisory committee.

   3.3. Students will receive admission to candidacy after successfully demonstrating their ability to formulate a research problem. It shall consist of a research proposal defense in which students will be required to write and orally defend their research proposal to their graduate advisory committee. Review of comprehensive examinations will be accomplished as soon as possible by all members of the committee. Upon successful completion, the major professor and department head will recommend to the dean of graduate education that the student be admitted to Ph.D. candidacy.

   3.4. Students will contribute to original research, and thus enhance research activities within South Dakota. They participate in research through a dissertation or research project.

   3.5. Representatives from each institution will connect annually to collaborate on assessment of the program and student success levels.

4. **Curriculum – PhD**

   4.1. A common curriculum will be used by participating institutions that includes a requirement of 48 total credits. The common curriculum is maintained in the USD and MINES catalogs. (See Appendix B for a snapshot of the catalogs for the 2022-2023 academic year.) Within the degree, there are three core requirements. These requirements are introduction to data science, data analysis, and modeling and optimization. The core requirement of introduction to data science is satisfied by completion of either CSC 559 or CSC 557. The core requirement of data analysis is satisfied by completion of either MATH 543 or CSC 542. The core requirement of modeling and optimization is satisfied by completion of either ENGM 535 or MATH 575. Due to the breadth and nature of the degree, electives may come from a variety of departments. Elective courses will be selected by the graduate committee in consultation with the student and faculty advisor. To support the differing career arcs of students, participating institutions will retain the flexibility to

implement course substitutions and allow additional courses as electives as allowed at their local institution.

4.2. All students are required to work on a dissertation. These dissertation hours would be completed in the prefix of the student's focus area (e.g., CSC, MATH, ENGM) with the course number 898 Dissertation. A total of 36 credit hours of dissertation hours are required.

4.3. The rotation will include the delivery of courses offered during the Fall and Spring terms and ensure an equitable distribution of course offerings across institutions that also ensures that students may successfully complete the degree requirements in a timely fashion.

4.4. Faculty members from each institution have status that enables them to serve on the dissertation committees of students from the other institution provided that the faculty member meets the guidelines established by each institution for committee service.

5. Textbook & Instructional Resources
5.1. Consistent with BOR Policy 1.6.1 – Academic Freedom and Responsibility, institutional faculty are given academic freedom to select textbooks and instructional materials they deem appropriate for graduate coursework delivered through the consortium.

5.2. Since all the classes are shared between the two institutions, the textbooks chosen by the faculty would automatically be the common textbook.

6. Funding Model
6.1. Tuition revenue generated by the institution offering the course will remain with that institution.

6.1.1. For collaboratively-delivered courses, meaning those courses in which students from both institutions are enrolled, a separate section will be created at each institution. The student will register for the section at their home institution. The sections across the institutions will be cross-listed and enrollment across the sections will sum. Tuition revenue will go to the institution of the section in which the student is registered.

6.2. Students pursuing the completion of the degree at a main campus location will be assessed the on-campus rate approved by the SDBOR.

Students not enrolled in coursework at a main campus location will be assessed the established off-campus rate approved by the SDBOR.

Appendix A

Approved Course Rotation for Jointly Delivered Courses

Representatives from each institution will meet periodically as needed to extend the course rotation.

Fall 2023	Spring 2024	Fall 2024	Spring 2025
USD- MATH 575		MINES- CSC 559	USD-CSC 542
USD-CSC 557		MINES- ENGM 535	MINES- MATH 543
MINES- CSC 559			
MINES- ENGM 535			

Fall 2025	Spring 2026	Fall 2026	Spring 2027
USD- MATH 575		MINES- CSC 559	USD-CSC 542
USD-CSC 557		MINES- ENGM 535	MINES- MATH 543
MINES- CSC 559			
MINES- ENGM 535			

Sample Catalogs for the 2023-2024 Academic Year

Below are the sample catalogs. Note: the (C) in the USD catalogs denotes common courses.

Data Science and Engineering, PhD

PhD in Data Science and Engineering
Offered jointly with University of South Dakota (USD). Courses are offered at both South Dakota Mines and USD campuses.

Degree requirements

Distribution of credits

Core requirements: 12 credits
Research requirements: 24-36 credits
Elective requirements: 24 credits
Total credits: 72
At least 36 of the required 72 credits must be taken at the 600-level or above.
Students may apply 24 coursework credits and 6 research credits from a previous MS degree toward the PhD requirements, subject to approval by the student's committee.

Core requirements

- Introduction to data science
  - CSC 559 Introduction to Data Science and Engineering **Credits: 3** or
  - CSC 557 Data Analysis/Decision Making **Credits: 3**
- Data analysis
  - MATH 543 Data Analysis **Credits: 3** or
  - CSC 542 Applied Math for Data Science and Machine Learning **Credits: 3**
- Modeling and optimization
  - ENGM 535 Optimization Techniques **Credits: 3** or
  - MATH 575 Operations Research **Credits: 3**
- CSC 790 Seminar **Credits: (1-0) 1** *

* A minimum of 3 credits of CSC 790 are required.

Elective requirements

Each PhD program of study is individually designed to meet the goals of the student. Courses from a variety of areas, for example biology, chemical engineering, chemistry, computer engineering, computer science, electrical engineering, industrial engineering, materials and metallurgical engineering, mathematics, mechanical engineering, or other disciplines may be used to fulfill the elective requirements in a manner intended to complement the student's research. Elective courses in the area of the student's intended

research are to be selected in consultation with, and approved by, the student's advisory committee and major advisor.

Research requirements

The completion of a doctoral dissertation, approved by the student's graduate advisory committee and the Dean of Graduate Education, is required for this degree. PhD students are expected to participate in the creation of new knowledge and applications in data science and engineering.

- CSC/MATH/IENG 898 Dissertation **Credits: Credit to be arranged** **
  **24-36 credits of 898D are required. No more than 36 credits of 898D may be counted toward the degree.

Examinations

Detailed information on qualifying policies, admission to candidacy, and defense of dissertation may be found in the graduate program handbook.

Qualifying requirements

The qualifying requirements tests the student's background knowledge and ability to pursue advanced courses and dissertation research. All students coming into the Ph.D. program are required to take the qualifying exam within the first 2 years. The qualifying exam shall be satisfied by completing ONE of the items below:

- Successful completion of an oral or written examination on the student's coursework and general knowledge of the discipline.
- Successful publication of two high impact peer reviewed Journal or Conference papers as approved by the student's graduate committee.
- Successful presentation of two papers in the student's field of study (one seminal paper, and one paper at the boundary of knowledge as indicated by the date of publication being no older than two years from the date of the examination). The student will work with their graduate advisor to discuss and ultimately select the papers for presentation. These presentations could occur at a conference, local seminar, or to the student's committee.
- The successful defense of a master's thesis may be used as the qualifying examination, at the discretion of the student's graduate advisory committee.

Comprehensive examination and admission to candidacy

The comprehensive examination is given to evaluate the student's ability to formulate a research problem. It shall consist of a research proposal defense in which students will be required to write and orally defend their research proposal to their graduate advisory committee. Review of comprehensive examinations will be completed as soon as possible by all members of the committee. Upon successful completion, the major professor and department head will recommend to the dean of graduate education that the student be admitted to Ph.D. candidacy.

All students coming into the Ph.D. program with an M.S. degree are required to complete the comprehensive exam within two academic years (fall, spring, summer semesters). Students coming into the program with a BS degree must complete the comprehensive exam after their coursework is substantially completed. The comprehensive examination, and subsequent admission to candidacy, should be passed at least 12 months before the dissertation is defended or at the discretion of the committee.

Dissertation defense

A dissertation defense and a final oral examination are required for this degree. These requirements are managed by the student's committee in accordance with the policies established by each institution.