SOUTH DAKOTA BOARD OF REGENTS
ACADEMIC AFFAIRS FORMS

Substantive Program Modification Form

UNIVERSITY:	**University of South Dakota**
CURRENT PROGRAM TITLE:	**M.S., Physics, Analytics for Large Data Sets Specialization**
CIP CODE:	**40.0801**
UNIVERSITY DEPARTMENT:	**Physics**
UNIVERSITY DIVISION:	**Arts & Sciences**

University Approval

To the Board of Regents and the Executive Director: I certify that I have read this proposal, that I believe it to be accurate, and that it has been evaluated and approved as provided by university policy.

Elizabeth M. Freeburg	2/21/19
Vice President of Academic Affairs or President of the University	Date

1. This modification addresses a change in:

☐ Total credits required within the discipline ☐ Total credits of supportive course work

☒ Total credits of elective course work ☒ Total credits required for program

☐ Program name ☐ Existing specialization

☐ CIP Code ☐ Other (explain below)

2. Effective date of change (enter catalog year): Catalog 2019-2020

3. Program Degree Level:

Associate ☐ Bachelor's ☐ Master's ☒ Doctoral ☐

4. Category:

Certificate ☐ Specialization ☐ Minor ☐ Major ☒

5. If a name change is proposed, the change will occur:

☐ On the effective date for all students

☐ On the effective date for students new to the program (enrolled students will graduate from existing program)

Proposed new name: _____

Reminder: Name changes may require updating related articulation agreements, site approvals, etc.

6. Primary Aspects of the Modification (*add lines or adjust cell size as needed*):

Existing Curriculum

Pref.	Num.	Title	Cr. Hrs.
Major Area Coursework (17 cr)			
PHYS	543	Statistical Physics	2
PHYS	551	Classical Mechanics	4
PHYS	571	Quantum Mechanics	4
PHYS	790	Seminar	1
PHYS	798	Thesis	6
Analytics for Large Data Sets Specialization Requirements (15 cr)			
CSC	721	Distributed Systems	3
CSC	785	Information Storage and Retrieval	3
MATH	792	Topics (Topics in Statistics)	3
PHYS	792	Topics (Topics in Big Data and Data Analytics)	3
Select one of the following two courses			
CSC	548	Machine Learning	3
CSC	686	Data Mining	3
Department Approved Electives at the 700 level			4

Accelerated Master's Program: BA or BS/MS (Plan A Analytics for Large Data Sets Specialization only)

Up to 12 graduate credits applied toward the B.S. program may be used to satisfy graduate requirements.

The following restrictions apply:

a. Dual-listed courses taken at the 500-level can be applied to both the B.S. and M.S. degrees. Dual-listed courses must be taken at the 500-level.
b. The student must apply to, and be admitted to, the accelerated program prior to taking courses to be credited toward the accelerated program.
c. No courses taken prior to admission to the accelerated program may be counted toward an accelerated graduate degree. No exceptions to this policy will be approved.
d. Courses that are "double counted" must be approved by the program coordinator for inclusion in the program of study prior to registration for the course or the credits will not be applied toward the accelerated graduate degree. No exceptions to this policy will be approved.
e. Only courses taken at the student's home institution are eligible for dual credit. No transferred courses from other institutions will be allowed to count toward the accelerated master's degree.

Students admitted to the accelerated M.S. Program may be allowed to register for all courses included on his/her program of study and these credit hours may apply to both undergraduate and graduate degree requirements.

Total number of hours required for specialization	21
Total number of hours required for degree	36

Proposed Curriculum (highlight changes)

Pref.	Num.	Title	Cr. Hrs.
Major Area Coursework (17 cr)			
PHYS	543	Statistical Physics	2
PHYS	551	Classical Mechanics	4
PHYS	571	Quantum Mechanics	4
PHYS	790	Seminar	1
PHYS	798	Thesis	6
Analytics for Large Data Sets Specialization Requirements (15 credit hours is required from the following list of courses with at least 6 from Category A - Computing and at least 6 credits from Category B – Statistics and Analytics. At least 9 credits must be at the 700 level or higher.)			
Category A - Computing			
CSC	584	Database Management Systems	3
CSC	586	Data Mining	3
CSC	721	Distributed Systems	3
CSC	785	Information Storage and Retrieval	3
CSC	722	Machine Learning Fundamentals	3
Delete			
Category B – Statistics and Analytics			
CSC	505	Analytics Programming Fundamentals	3
MATH	580	Applied Statistics	3
MATH	581	Probability and Statistics	3
MATH	735	Mathematical Modeling	3
PHYS	792	Topics (Topics in Big Data and Data Analytics)	3
PHYS	792	Topics (Topics in Statistical Analysis)	3

Accelerated Master's Program: BA or BS/MS (Plan A Analytics for Large Data Sets Specialization only)

Up to 12 graduate credits applied toward the B.S. program may be used to satisfy graduate requirements.

The following restrictions apply:

a. Dual-listed courses taken at the 500-level can be applied to both the B.S. and M.S. degrees. Dual-listed courses must be taken at the 500-level.
b. The student must apply to, and be admitted to, the accelerated program prior to taking courses to be credited toward the accelerated program.
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e. Only courses taken at the student's home institution are eligible for dual credit. No transferred courses from other institutions will be allowed to count toward the accelerated master's degree.

Students admitted to the accelerated M.S. Program may be allowed to register for all courses included on his/her program of study and these credit hours may apply to both undergraduate and graduate degree requirements.

Total number of hours required for specialization	17
Total number of hours required for degree	32

7. **Explanation of the Change:**

The changes serve three primary purposes.
1. They bring the total number of credits required in line with the requirements of the existing non-specialization Masters requirements. The specialization in large data and analytics prepares students for relevant job outcomes by requiring students to take courses across the three departments that offer the necessary courses. However, there are multiple areas in data analytics in which a student might focus. The increased flexibility gained by bringing the credit requirement in line with other Physics Masters will give students more options to take courses that directly impact their career goals. For example, a student might take an extra course in statistics or data mining.
2. The program has a functional need for an increased level of flexibility for several reasons. Course offerings will naturally evolve in a significant way over time because the curricular requirements span three departments. Long-term program stability and success requires the program to be able to dynamically address student needs regardless of departmental evolution. Two of the current Specialization Requirement courses listed in the existing specialization requirements will not be offered. The proposed curriculum addresses this issue by removing the non-offered courses and allowing students to select between multiple course options.
3. Students entering the program typically do not have a sufficient computer science background to enable them to step straight into graduate computer science courses. As a result, the students have a shorter time window for taking the required graduate computer science courses. The increased flexibility in the Specialization Requirement courses allows them to fit the necessary courses into the normal Master's time window.