SOUTH DAKOTA BOARD OF REGENTS
ACADEMIC AFFAIRS FORMS

New Baccalaureate Degree Minor

Use this form to propose a new baccalaureate degree minor (the minor may include existing and/or new courses. An academic minor within a degree program enables a student to make an inquiry into a discipline or field of study beyond the major or to investigate a particular content theme. Minors provide a broad introduction to a subject and therefore develop only limited competency. Minors consist of a specific set of objectives achieved through a series of courses. Course offerings occur in a specific department or may draw from several departments (as in the case of a topical or thematic focus). In some cases, all coursework within a minor proscribed; in others cases, a few courses may form the basis for a wide range of choices. Regental undergraduate minors typically consist of 18 credit hours. Proposals to establish new minors as well as proposals to modify existing minors must recognize and address this limit. The Board of Regents, Executive Director, and/or their designees may request additional information about the proposal. After the university President approves the proposal, submit a signed copy to the Executive Director through the system Chief Academic Officer. Only post the New Baccalaureate Degree Minor Form to the university website for review by other universities after approval by the Executive Director and Chief Academic Officer.

UNIVERSITY:	NSU
TITLE OF PROPOSED MINOR:	**Data Science**
DEGREE(S) IN WHICH MINOR MAY BE EARNED:	**All baccalaureate degrees**
EXISTING RELATED MAJORS OR MINORS:	**Math**
INTENDED DATE OF IMPLEMENTATION:	**Fall 2024**
PROPOSED CIP CODE:	**27.0101**
UNIVERSITY DEPARTMENT:	**Science and Math**
BANNER DEPARTMENT CODE:	**NSCM**
UNIVERSITY DIVISION:	**College of Arts and Sciences**
BANNER DIVISION CODE:	**5A**

☒ **Please check this box to confirm that:**

- The individual preparing this request has read AAC Guideline 2.3.2.2.D, which pertains to new baccalaureate degree minor requests, and that this request meets the requirements outlined in the guidelines.
- This request will not be posted to the university website for review of the Academic Affairs Committee until it is approved by the Executive Director and Chief Academic Officer.

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.

Michael Warous — President (or Designee) of the University

5/2/2024 — Date

Note: In the responses below, references to external sources, including data sources, should be documented with a footnote (including web addresses where applicable).

1. **Do you have a major in this field (*place an "X" in the appropriate box*)?** ☐ *Yes* ☒ *No*

2. **If you do not have a major in this field, explain how the proposed minor relates to your university mission and strategic plan, and to the current Board of Regents Strategic Plan 2014-2020.**
   Links to the applicable State statute, Board Policy, and the Board of Regents Strategic Plan are listed below for each campus.

BHSU:	*SDCL § 13-59*	*BOR Policy 1.2.1*
DSU:	*SDCL § 13-59*	*BOR Policy 1.2.2*
NSU:	*SDCL § 13-59*	*BOR Policy 1.2.3*
SDSMT:	*SDCL § 13-60*	*BOR Policy 1.2.4*
SDSU:	*SDCL § 13-58*	*BOR Policy 1.2.5*
USD:	*SDCL § 13-57*	*BOR Policy 1.2.6*

Board of Regents Strategic Plan

   A common and growing field of employment for students with a background in Mathematics is data science. Northern's Minor in Data Science is in alignment with Goal 4 of the SD Board of Regents Strategic Plan to prepare students for workforce needs and "place a special emphasis on STEM, Teacher Education, Nursing and Healthcare, and Business undergraduate completion."[1]

   Students in the BS in Mathematics are required to earn a minor or a second major, and the Data Science Minor is a excellent choice in a Minor for Mathematics majors. The availability of the Data Science minor will be a recruiting opportunity for the Mathematics program. Additionally, this minor is suitable and beneficial for students majoring in the fields of physical, biomedical, behavioral, or social sciences where inferential and computational analysis is regularly utilized.

3. **What is the nature/purpose of the proposed minor? Please include a brief (1-2 sentence) description of the academic field in this program.**

   Data science combines core concepts and techniques of statistics, mathematics, and computer science to collect and interpret data. These core concepts can be applied to problems in a variety of fields including the physical, biomedical, behavioral, and social sciences, equipping students from any major with a firm understanding of the methodological and conceptual tools of data-driven discovery.

4. **How will the proposed minor benefit students?**

   Students with a Data Science background know the essential skills and concepts of probability, statistics, and communication, allowing them to design and implement inferential and computational analysis within their own academic and career discipline. The Data Science Minor will provide students with practical knowledge of the concepts and techniques essential for data

[1] "Goal 4: Workforce and Economic Development." South Dakota Board of Regents Strategic Plan 2022-2027, page 15, https://sdbor.edu/wp-content/uploads/2023/09/StrategicPlan_22_27.pdf

analysis, including data ethics and proficiency in data-oriented computing and statistical methodology.

Northern's Data Science Minor will equip students from a wide variety of majors with essential skills to effectively design, implement, and critically assess inferential analysis within their specific disciplines. Students will develop strong analytical abilities and learn practical applications of data cleaning, data visualization, data collection, data management, and data integration. Students will learn ethical and effective techniques for exploring, collecting, communicating, processing, and making decisions with data as well as how to integrate these elements into an efficient data workflow.

Currently, SDSU has a data science minor and USD has a business analytics minor. The purpose of Northern's Minor in Data Science is driven by the needs of the workforce. The coursework selected in Northern's Data Science Minor is a collaborative effort that is heavily influenced by recommendations from faculty in the NSU School of Business. As a result of the collaboration between Mathematics and Business faculty, Northern's Data Science Minor marries courses from mathematics, statistics, business, and technology, which makes the program distinct from SDSU and USD's programs.

5. **Describe the workforce demand for graduates in related fields, including national demand and demand within South Dakota.** *Provide data and examples; data sources may include but are not limited to the South Dakota Department of Labor, the US Bureau of Labor Statistics, Regental system dashboards, etc. Please cite any sources in a footnote.*

   According to the U.S. Bureau of Labor Statistics, employment in the field of Data Science is projected to grow 35% from 2022 to 2032, "much faster than the average for all occupations. About 17,700 openings for data scientists are projected each year, on average, over the decade,"[2] with a median salary over $103,500.[3] The South Dakota Occupational Employment Projections 2020-2030 indicate that workforce projections for data scientists is expected to increase 36.84%.[4] National and regional projections point toward considerable growth in the Data Science field.

   According to the Occupational Information Network (O*NET), sponsored by the U.S. Department of Labor/Employment and Training Administration (USDO/ETA), there is a projected 33% growth nationally in workforce demand from 2020 to 2030.[5] Occupational wage and employment statistics provided by the U.S. Bureau of Labor Statistics indicates the following industries have the highest levels of employment of data scientists: [6]

[2] Bureau of Labor Statistics, U.S. Department of Labor, Occupational Outlook Handbook, Data Scientists, https://www.bls.gov/ooh/math/data-scientists.htm. (visited February 19, 2024).
[3] Bureau of Labor Statistics. U.S. Department of Labor. Career One Stop, Data Scientists, https://www.careeronestop.org/Toolkit/Careers/Occupations/occupation-profile.aspx?keyword=Data%20Scientists&onetcode=15-2051.00&location=United%20States. (visited February 19, 2024).
[4] South Dakota Department of Labor and Regulation, Statewide South Dakota Employment Projections by Occupation 2020-2030, https://dlr.sd.gov/lmic/menu_projections_occupation_statewide.aspx. (visited February 19, 2024)
[5] Occupational Information Network (O*NET), U.S. Department of Labor/Employment and Training Administration (USDO/ETA), Data Scientists. https://www.onetonline.org/link/localtrends/15-2051.00?st=SD (visited February 19, 2024).
[6] Bureau of Labor Statistics, U.S. Department of Labor, Occupational Wage and Employment Statistics, Actuaries, https://www.bls.gov/oes/current/oes152011.htm. (visited February 19, 2024).

Industry	Employment	Percent of industry employment	Hourly mean wage	Annual mean wage
Computer Systems Design and Related Services	21,440	0.87	$ 56.63	$ 117,800
Management of Companies and Enterprises	15,440	0.58	$ 54.77	$ 113,920
Management, Scientific, and Technical Consulting Services	11,640	0.66	$ 53.10	$ 110,450
Scientific Research and Development Services	8,380	0.97	$ 60.39	$ 125,620
Insurance Carriers	8,320	0.69	$ 53.43	$ 111,130

6. Provide estimated enrollments and completions in the table below and explain the methodology used in developing the estimates.

	Fiscal Years*			
	1st	2nd	3rd	4th
Estimates	**FY 25**	**FY 26**	**FY 27**	**FY 28**
Students enrolled in the minor (fall)	**7**	**12**	**17**	**22**
Completions by graduates	**0**	**0**	**7**	**12**

*Do not include current fiscal year.

It is anticipated that there will be strong interest in this minor among students with majors in mathematics, accounting, finance, business administration, sociology, and the health fields. The above enrollment estimates are based on 10% of the average student enrollment in the Accounting, Banking and Financial Services, Sociology, and Mathematics (BS/BSEd) majors as of fall 2023 for year 4. Because the demand for data scientists is expected to grow much faster than average by 2032 (see item 5 above), it is expected that enrollment in the minor will increase.

7. What is the rationale for the curriculum? Demonstrate/provide evidence that the curriculum is consistent with current national standards.

The coursework required for understanding data science and its operations is centered on analytical knowledge as well as mathematical skills. Students should be able to understand complex data sets and statistical software packages (e.g., Python/R), to effectively manage/understand said data sets. The curriculum incorporates both math and data analytics through a myriad of courses in data management and systems as well as math and business.

8. Complete the tables below. Explain any exceptions to Board policy requested.
Minors by design are limited in the number of credit hours required for completion. Minors typically consist of eighteen (18) credit hours, <u>including</u> prerequisite courses. In addition, minors typically involve existing courses. If the curriculum consists of more than eighteen (18) credit hours (including prerequisites) or new courses, please provide explanation and justification below.

A. Distribution of Credit Hours

Data Science	Credit Hours	Percent
Requirements in minor	16	64%
Requirements in minor that can be taken to fulfill required courses in the math, finance, accounting, or business majors.	(7)	
Electives in minor	9	36%
Total	25 (18)	100%

B. Required Courses in the Minor

Prefix	Number	Course Title *(add or delete rows as needed)*	Prerequisites for Course *Include credits for prereqs in subtotal below.*	Credit Hours	New (yes, no)
BADM	459	Analytics	BADM 220 (3 cr.), MATH 281 (3 cr.) or STAT 281 (3 cr.)	3	No
MATH	381	Introduction to Probability and Statistics	MATH 125 (4 cr.)	3	No
MIS	150	Computer Science I		3	No
			Subtotal	16 (7)	

9. Elective Courses in the Minor: List courses available as electives in the program. Indicate any proposed new courses added specifically for the minor.

Prefix	Number	Course Title *(add or delete rows as needed)*	Prerequisites for Course *Include credits for prerequisites in subtotal below.*	Credit Hours	New (yes, no)
Choose 3 from the following (9 credits):					
BADM	424	Operations Research	BADM 220 (3 cr.) or STAT 281 (3 cr.)	3	No
BADM	492	Analytics II	BADM 459	3	No
MATH	316	Discrete Mathematics	MATH 225	3	No
MATH	412	Linear Algebra	MATH 125	3	No
MIS	250	Computer Science II	CSC 150 (3 cr.) or MIS 150 (3 cr.)	3	No
MIS	371	Survey of Data Structures	MIS 150 (3 cr.)	3	No
MIS	385	Data Mining		3	No
MIS	480	Business Intelligence	BADM 220 (3 cr.) and MIS 325 (3 cr.)	3	No
MIS	484	Database Management Systems		3	No
			Subtotal	9	

Explanation and justification for more than 18 credit hours, including prerequisites. Students majoring in BS Mathematics will take MATH 381 and the pre-requisite in their major, which reduces the total credits of new courses to meet the minor to 18. Students majoring in Finance, Accounting, and Business fields will take BADM 459 and the pre-requisite in their major, which reduces the total credits of new courses to meet the minor to 18.

Students pursuing the Minor in Data Science will be guided by their academic advisors to select the best options that coincide with meeting general education requirements and/or their individual major program requirements so that no additional credit hours above the 18 will be required for the minor.

The pre-requisite for MATH 381 is MATH 125 Calculus II. Students pursuing the Data Science Minor who are not also pursuing the BS Mathematics will be guided by their academic advisor to take MATH 125 to fulfill their SDBOR Goal #5 general education requirement so that no additional credit hours are required for the minor. For those students pursuing this minor who are also pursuing the BS Mathematics, MATH 125 is a required course within the major, so no additional credit hours are required for the minor.

A. What are the learning outcomes expected for all students who complete the minor? How will students achieve these outcomes?

	Program Courses that Address the Outcomes					
Individual Student Outcome (Same as in the text of the proposal)	BADM 459	BADM 424 BADM 480	MATH 381	MIS 150 MIS 250 MIS 484	MIS 371	MIS 385
Use basic programming concepts and techniques to clean, wrangle, and organize data				X		
Perform effective exploratory data analysis and visualization of datasets	X		X			
Connect real-world objectives in data analysis to formal mathematical tools		X				
Demonstrate a clear understanding of issues related to bias, fairness, and privacy with respect to data science applications					X	X
Apply data science techniques to problems from various disciplines and effectively synthesize, present and communicate results	X					X

Faculty in Mathematics and the School of Business collaborated to map the learning outcomes over the courses required in the minor. Students will achieve these outcomes through weekly coursework, quizzes, and exams.

10. What instructional approaches and technologies will instructors use to teach courses in the minor? *This refers to the instructional technologies and approaches used to teach courses and NOT the technology applications and approaches expected of students.*

The instructional technologies used for the courses within this minor will be consistent with those available and utilized for other NSU courses. The majority of courses will be offered via face-to-face delivery with some options for HyFlex or online delivery.

The instructional approaches used will include lecture, discussion, application assignments, and written exercises.

11. Delivery Location

Note: The accreditation requirements of the Higher Learning Commission (HLC) require Board approval for a university to offer programs off-campus and through distance delivery.

A. Complete the following charts to indicate if the university seeks authorization to deliver the entire program on campus, at any off campus location (e.g., USD Community Center for Sioux Falls, Black Hills State University-Rapid City, Capital City Campus, etc.) or deliver the entire program through distance technology (e.g., as an online program)?

	Yes/No	***Intended Start Date***
On campus	Yes	**Fall 2024**

	Yes/No	***If Yes, list location(s)***	***Intended Start Date***
Off campus	No		Choose an item. Choose an item.

	Yes/No	***If Yes, identify delivery methods*** *Delivery methods are defined in AAC Guideline 2.4.3.B.*	***Intended Start Date***
Distance Delivery (online/other distance delivery methods)	Yes	X01 (Face-to-Face) X02 (HyFlex) X03 (HyFlex Synchronous) X15 (Online Asynchronous)	**Fall 2024**
Does another BOR institution already have authorization to offer the program online?	No	**If yes, identify institutions:**	

B. Complete the following chart to indicate if the university seeks authorization to deliver more than 50% but less than 100% of the minor through distance learning (e.g., as an online program)? *This question responds to HLC definitions for distance delivery.*

	Yes/No	***If Yes, identify delivery methods***	***Intended Start Date***
Distance Delivery (online/other distance delivery methods)	No		**Fall 2024**

12. **Does the University request any exceptions to any Board policy for this minor? Explain any requests for exceptions to Board Policy.** *If not requesting any exceptions, enter "None."*

    Northern State University requests an exception to Board policy to run this minor with more than 18 credits. As the response to item 8 above indicates, students enrolled in this minor will be closely guided by their professional academic advisors to select the best options that coincide with meeting their general education requirements and/or their individual major requirements so that they can earn the minor with 18 credits.

    Similar minors in Data Science incorporate Math, Business Analytics, and Computer Science are more than 18 credits. See, for example, Ithaca College's minor in data science, which is steadily growing in enrollments: https://catalog.ithaca.edu/undergrad/schools/school-humanities-sciences/department-mathematics/data-science-minor/

    Northern State University is launching the Data Science Minor at very little cost to the University because all courses are in place and are regularly taught with seats available. If the minor grows in enrollments to justify creation of an interdisciplinary data science major at Northern, then faculty will need to be added.

13. **Cost, Budget, and Resources: Explain the amount and source(s) of any one-time and continuing investments in personnel, professional development, release time, time redirected from other assignments, instructional technology & software, other operations and maintenance, facilities, etc., needed to implement the proposed minor.** *Address off-campus or distance delivery separately.*

    Faculty are currently teaching these courses. There are no additional costs to creating a pertinent minor, one that will help prepare students for the workforce and increase enrollments.

14. **New Course Approval: New courses required to implement the new minor may receive approval in conjunction with program approval or receive approval separately. Please check the appropriate statement (*place an "X" in the appropriate box*).**

    ☐ YES,
    the university is seeking approval of new courses related to the proposed program in conjunction with program approval. All New Course Request forms are included as Appendix C and match those described in section 7.

    ☒ NO,
    the university is not seeking approval of all new courses related to the proposed program in conjunction with program approval; the institution will submit new course approval requests separately or at a later date in accordance with Academic Affairs Guidelines.

15. **Additional Information:** *Additional information is optional. Use this space to provide pertinent information not requested above. Limit the number and length of additional attachments. Identify all attachments with capital letters. Letters of support are not necessary and are rarely included with Board materials. The University may include responses to*

questions from the Board or the Executive Director as appendices to the original proposal where applicable. Delete this item if not used.

N/A