SOUTH DAKOTA BOARD OF REGENTS

Academic and Student Affairs
Consent

AGENDA ITEM: 6 – E (1)
DATE: August 2-4, 2022

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SUBJECT

New Specialization Request – SDSMT – Specialization in Actuarial Science – BS in Mathematics

CONTROLLING STATUTE, RULE, OR POLICY

BOR Policy 2:23 – Program and Curriculum Approval

BACKGROUND / DISCUSSION

South Dakota School of Mines & Technology (SDSMT) requests authorization to offer a specialization in Actuarial Science within the BS in Mathematics. The proposed specialization will focus the discipline of actuarial science, which is modeling and calculating risk using mathematical and statistical methods. This is a growing field with applications in insurance, finance, criminal justice, and industry. Between 10% and 12% of Mines mathematics graduates pursue careers in the actuarial sciences. As such, the proposed specialization seeks to capitalize on Mines students' success and interest in this area.

IMPACT AND RECOMMENDATION

SDSMT requests authorization to offer the specialization on campus. SDSMT is not requesting additional state resources to offer the program. No new courses will be required.

Board office staff recommends approval of the program.

ATTACHMENTS

Attachment I – New Specialization Request Form: SDSMT – Actuarial Science – BS in Mathematics

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DRAFT MOTION 20220802_6-E(1):

I move to authorize SDSMT to offer a specialization in Actuarial Science within the BS in Mathematics, as presented.

SOUTH DAKOTA BOARD OF REGENTS
ACADEMIC AFFAIRS FORMS

New Specialization

Use this form to propose a new specialization within an existing degree program. Specializations provide students with an alternative to the primary format of the major or it may be one of several tracks within a broad major. Specializations contain courses within the discipline(s) of the existing program. Specializations appear in the institutional catalog and on the transcript. Majors that offer specializations typically have one-third to two-thirds of the credits in common with the remaining course work fulfilling the requirements of the specialization(s) offered. 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 Specialization Form to the university website for review by other universities after approval by the Executive Director and Chief Academic Officer.

UNIVERSITY:	**SDSM&T**
TITLE OF PROPOSED SPECIALIZATION:	**Actuarial Science**
NAME OF DEGREE PROGRAM IN WHICH SPECIALIZATION IS OFFERED:	**Mathematics**
BANNER PROGRAM CODE:	**MBS.MTH**
INTENDED DATE OF IMPLEMENTATION:	**6/1/2022**
PROPOSED CIP CODE:	**27.0304**
UNIVERSITY DEPARTMENT:	**Mathematics**
BANNER DEPARTMENT CODE:	**MMTH**
UNIVERSITY DIVISION:	**4L**
BANNER DIVISION CODE:	**4L**

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

- The individual preparing this request has read AAC Guideline 2.6, which pertains to new specialization 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.

	Click here to enter a date.
Institutional Approval Signature *President or Chief Academic Officer of the University*	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. **Level of the Specialization (*place an "X" in the appropriate box*):**

Baccalaureate ☒ Master's ☐ Doctoral ☐

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

South Dakota Mines requests authorization to offer an Actuarial Science Specialization in its B.S. in Mathematics. The proposed specialization is in the field of Actuarial Science, the discipline of modeling and calculating risk using mathematical and statistical methods. Actuarial science is a rapidly growing field with applications in insurance, finance, criminal justice, and industry.

Between 10% and 12% of South Dakota Mines Mathematics graduates pursue careers in the actuarial sciences, taking on positions such as actuaries, risk analysts, and liability analysts with companies including Assurant, Boeing, Huntington National Bank, S&P Global, TD Ameritrade, and Western Union. Actuarial science is also one of the most popular areas of interest for prospective South Dakota Mines mathematics majors. The proposed specialization seeks to capitalize on Mines students' success and interest, combining the Mathematics Department's robust instruction in applied and computational mathematics (including statistics, numerical methods, and data analysis) with further courses in computational decision making and finance to provide students a strong undergraduate preparation in the field of actuarial science. It codifies a pathway through pre-existing elective MATH, CSC, IENG, ACCT and other coursework that has been previously shown effective in securing Mathematics graduates careers in actuarial science fields. Thus, this proposal requires no new courses or new state resources.

Graduates earning the specialization will have the necessary mathematical and computational skills needed to prepare them for a career in actuarial sciences. They will be well-prepared to enter the workforce as actuaries and risk analysts, or to pursue competitive graduate education in actuarial science or similar disciplines.

3. **Provide a justification for the specialization, including the potential benefits to students and potential workforce demand for those who graduate with the credential.**

It is not an overstatement to say that the work of actuarial science professionals is of life-and-death importance: the majority of them work in health, life, casualty, and property insurance, where they analyze data and assess risk to protect the overall financial health of their clients and employers. And the amount of data increases every day: according to **Domo**, in 2017 roughly 2.5 *quintillion* bytes of data were created *every day*[1], and that by 2020 there was 40 times more bytes of data than there are stars in the observable universe[2].

This increase in data creates new avenues from which to analyze risks and develop policies to address them. As reported in the **Financial Times**[3], "from weather patterns to social media,

[1] https://www.domo.com/learn/infographic/data-never-sleeps-5
[2] https://www.domo.com/learn/infographic/data-never-sleeps-7
[3] https://www.ft.com/content/3273a7d4-00d2-11e6-99cb-83242733f755

new sources of data could help [insurers] streamline costs, be more targeted with the risks they want to underwrite, identify new customers, predict fraud, or identify claims that have the potential to become very expensive."

Consequently, there is a critical need for trained mathematicians to effectively analyze and process data to effectively assess risk. A January 22, 2022, search of **Indeed.com** lists some 3300 job positions for *actuary* or *actuarial analyst*, with employers including Blue Cross Blue Shield, Kaiser Permanente, Farmers Insurance Group, Liberty Mutual, State Farm, Crum & Forster, Milliman, Toyota, Westfield, and Aflac.

And the demand for actuarial science jobs continues to grow. The **U.S. Bureau of Labor Statistics** reports that in 2020 there were nearly 28,000 actuarial jobs in the United States, with an average salary of $111,030. Moreover, the number of actuarial jobs is expected to increase by another nearly 24% by 2030[4]. **Forbes** (quoting *Bankrate*) declared actuarial science "the most valuable" STEM specialization[5], citing its high average salary and low unemployment rate of 2.3%.

The proposed specialization will allow its graduates to capitalize on this growing professional need. Actuarial science jobs aren't just in demand – they are the beginnings of satisfying careers. **U.S. News and World Report** ranks Actuary as #20 in its 2022 list of 100 Best Jobs in America, #11 in its list of Best STEM jobs, and #7 in its list of Best Business Jobs.[6] The same publication ranked Actuary #24 in 2021.

4. List the proposed curriculum for the specialization (including the requirements for completing the major – *highlight courses in the specialization*):

Prefix	Number	Course Title	Credit Hours	New (yes, no)
Mathematics Degree Requirements				
MATH	110	Survey of Mathematics	1	No
MATH	123	Calculus I	4	No
MATH	125	Calculus II	4	No
MATH	225	Calculus III	4	No
MATH	315	Linear Algebra	3	No
MATH	321	Differential Equations	3	No
MATH	373	Numerical Methods	3	No
MATH	381	Introduction to Probability and Statistics	3	No
MATH	413	Abstract Algebra I	3	No
MATH	423	Advanced Calculus I	3	No
MATH	498	Undergraduate Research	1	No
MATH	402	Communicating Mathematics	1	No
CSC	251	Finite Structures	3	No

[4] https://www.bls.gov/ooh/math/actuaries.htm
[5] https://www.forbes.com/sites/kateashford/2018/09/12/stem-degree
[6] https://money.usnews.com/careers/best-jobs/actuary

MATH sequence elective			3	No
MATH upper-level elective			3	No
Department-approved upper-level electives			6	No
Computer science sequence			6-7	No
English communications requirement (ENGL 101, 278, 279)			9	No
Humanities and Social Sciences General Education requirement			12	No
Science requirement (PHYS 211, approved 2nd science course and lab)			7	No
Free electives			36	No
Actuarial Science Specialization*				
Required courses				
MATH	382	Probability and Statistics II	3	No
MATH	443	Data Analysis	3	No
MATH	451	Mathematical Modeling	3	No
Select two of the following:				
IENG	362	Stochastic Models	3	No
IENG	415	Decision Analysis	3	No
ENGM	435	Optimization Techniques	3	No
CSC	484	Database Management Systems		
Select two of the following:				
IENG	302	Engineering Economics	3	No
ACCT	210	Principles of Accounting I **	3	No
ACCT	211	Principles of Accounting II **	3	No
BADM	310	Business Finance **	3	No

Total number of hours required for completion of specialization	21
Total number of hours required for completion of major	68
Total number of hours required for completion of degree	120

* The required 21 credits for the completion of the specialization may be obtained from a combination of various upper-level and free electives for the Mathematics B.S.

- MATH 382 fulfills the MATH sequence elective
- MATH 443 fulfills the MATH upper-level elective
- MATH 451, IENG 362, and IENG 415 are upper-level electives.
- The remaining classes are free electives.

** These courses are not taught at South Dakota Mines but are readily available within the SDBOR system and at the Rapid City University Center.

5. 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., UC Sioux Falls, Capital University Center, Black Hills State University-Rapid City, etc.) or deliver the entire specialization through distance technology (e.g., as an on-line program)?

	Yes/No	***Intended Start Date***
On campus	Yes	**Fall 2022**

	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 5.5.*	***Intended Start Date***
Distance Delivery (online/other distance delivery methods)	No		Choose an item. Choose an item.

B. Complete the following chart to indicate if the university seeks authorization to deliver more than 50% but less than 100% of the specialization through distance learning (e.g., as an on-line 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		Choose an item. Choose an item.