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| S:\Communications\Logos and photos\SDBORLogos\final_sdbor_webreadyBW_trans.gif | **SOUTH DAKOTA BOARD OF REGENTS**  ACADEMIC AFFAIRS FORMS |
| New Certificate |
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| **UNIVERSITY:** | **DSU** |
| **TITLE OF PROPOSED CERTIFICATE:** | **Advanced Graduate Mathematics Certificate** |
| **INTENDED DATE OF IMPLEMENTATION:** | **8/15/2019** |
| **PROPOSED CIP CODE:** | **27.0101** |
| **UNIVERSITY DEPARTMENT:** | **DMATH** |
| **UNIVERSITY DIVISION:** | **College of Arts and 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.*

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| C:\Users\slaughts\AppData\Local\Microsoft\Windows\INetCache\Content.Word\Dr. McKay Signature.jpg |  | 4/26/2018 |
| Institutional Approval Signature  *President or Chief Academic Officer of the University* |  | Date |

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1. **Is this a graduate-level certificate or undergraduate-level certificate (*place an “X” in the appropriate box*)?**

|  |  |  |  |
| --- | --- | --- | --- |
| Undergraduate Certificate |  | Graduate Certificate |  |

1. **What is the nature/purpose of the proposed certificate?**

Dakota State University is proposing to teach three graduate math content courses online to high school mathematics teachers (as well as to others capable of completing graduate math courses) that currently hold a master’s degree or are enrolled in a master’s degree program and have already completed three graduate math or stat content courses. The target audience of students includes those that have earned the graduate stat certificate through SDSU or the Introductory Graduate Math Certificate at DSU have met this requirement so they can become concurrent dual credit instructors and earn a Graduate Math Certificate. The goal is to increase the number of high school teachers that can serve as concurrent dual credit instructors and decrease the number of high school students taking online classes, in particular online college algebra classes.

The HLC Guidelines (<http://download.hlcommission.org/FacultyGuidelines_2016_OPB.pdf>) specifically address the qualifications of dual credit instructors (“Determining Minimally Qualified Faculty in the Context of Dual Credit”). Dual credit instructors are expected to meet the same faculty qualifacations as university instructors. Those expectations include a Masters Degree and at least 18 graduate content credits in mathematics using the credentials criteria. To meet these guidelines participants would need to complete both the Graduate Math Certificate and the Advanced Graduate Math Certificate to earn the 18 graduate math content credits.

The HLC requirement to be a concurrent dual credit instructor is to have a master’s degree and if the master’s degree is not in the content area then the instructor must have 18 graduate content credits in the discipline being taught which is why we have requested two 9 credit graduate mathematics certificates.

There are several programs across the country that have been created in an effort to provide a mechanism for high school teachers to earn the credentials necessary to meet the HLC guidelines to be concurrent dual credit instructors. Below are a few examples, but there are many more that come up in an internet search.

Indiana University East (<http://www.iue.edu/nsm/math/graduate-certificate-mathematics.php>) offers a program titled “Online Graduate Certificate in Mathematics.” The following is the program description from the webpage linked above.

“The Graduate Certificate in Mathematics offers graduate level education in mathematics. The program is intended for students who wish to prepare for admission to graduate studies at another institution, or for holders of a Master's degree in a discipline other than mathematics, who teach mathematics classes at the community college level. The program is also open to high school teachers who wish to obtain the qualification to teach Advanced Placement courses.”

The goal of the proposed program is very similar in nature which is to provide credentials to program completers to be concurrent dual redit mathematics teachers.

In addition to requiring a total of six classes (18 credit hours), they also require students to complete one course from the areas of analysis, algebra, topology/geometry, applications and probability-statistics.

There are other programs which are similar in nature and below is a list of a few of these programs with links to their programs.

Indiana University Wesleyan - <https://www.indwes.edu/adult-graduate/programs/graduate-certificate-math/requirements>

George Washington University - <https://math.columbian.gwu.edu/graduate-certificate-mathematics>

Villanova University - <https://www1.villanova.edu/villanova/artsci/mathematics/academic-programs/certificate.html>

Texas Tech University - <https://www.depts.ttu.edu/elearning/certificate/mathematics/>

The common theme for these certificate programs is bluntly stated on the Texas Tech certificate page: *“The Graduate Certificate in Mathematics is an online 18-hour certificate designed for anyone with a master's or doctoral degree who wants to increase mastery of mathematics, particularly in-service teachers who desire to teach dual credit in high school or teach at a junior college.”*

1. **Provide a justification for the certificate program, including the potential benefits to students and potential workforce demand for those who graduate with the credential.[[1]](#footnote-1)**

There are very few math teachers that have 18 graduate credit hours of math content courses and a master’s degree. As a result, students that take dual credit classes in mathematics either go to a state university, take them online or for some have a university faculty member go to their school. Most SD students either take dual credit courses online or they don’t participate in the dual credit program offered to South Dakota High School students. This program would enhance the credentials of program completers which would increase the education opportunities afforded to their students.

While the Department of Education changes have created a larger pool of teachers that are certified to teach high school mathematics courses, it has not enhanced the pool of high school teachers that have the credentials to be concurrent dual credit instructors. That is, more teachers can become endorsed in the state of South Dakota to teach high school mathematics (any teacher that passes the middle school math praxis exam is endorsed to teach lower level high school mathematics), however there are very few high school mathematics teachers that have 18 graduate math content credits which is an HLC guideline for being a dual credit instructor. Although DSU has been contacted by several schools interested in offering a concurrent dual credit college algebra course, we have yet to be contacted by a high school that has a math teacher who meets the 18 graduate credit hours of math content coursework. This is a workforce development proposal.

In the August 1, 2014, a blog from the Association of School Boards of South Dakota (<http://asbsd.org/index.php/plenty-of-concern/>) titled “Plenty of Concern over Teacher Shortages” reported that 29 of the 62 spring mathematics teaching jobs in the state were still vacant on May 28th. The June 18,2014, blog post (<http://asbsd.org/index.php/positions-tough-to-fill/>) reported that “75 percent of superintendents responding to the survey believed the [teaching applicant pool was inadequate](http://asbsd.org/index.php/survey-says/).”

In recent years there have been certification rule modifications which have created a larger pool of teachers certified to teach high school mathematics. The first of those rule changes allowed secondary math education majors to take the middle school Math Praxis exam and the most recent changes removed the Praxis exam altogether for applicants with a content major in mathematics.

This is a program that would enhance the qualifications of the participating high school mathematics teachers.

1. **Who is the intended audience for the certificate program (including but not limited to the majors/degree programs from which students are expected)?**

The Advanced Graduate Mathematics Certificate is a program designed for current high school mathematics teachers who are either enrolled in or have completed a master’s degree, are interested in getting credentials to teach concurrent dual credit math courses, and have already completed nine credit hours of graduate Mathematics courses through the Introductory Graduate Mathematics Certificate or another avenue in order to meet HLC requirements. The 18 credit sequence of the Introductory Graduate Mathematics Certificate and Advanced Graduate Mathematics Certificate would allow them to do that.

1. **List the courses required for completion of the certificate in the table below (if any new courses are proposed for the certificate, please attach the new course requests to this form):[[2]](#footnote-2)**

To earn the graduate math certificate and the advanced graduate math certificate, a student would need to complete 18 graduate credit hours in mathematics to meet HLC guidelines for being a dual credit math instructor. The following courses are required courses in the DSU Advanced Graduate Mathematics Certificate, however any graduate math content or stat content course in the SDBOR system or acceptable transfer can be used to replace one of these courses using the substitution process (a course not used to earn the Graduate Math Certificate, must total 18 credits). Note, it must be a content math course so that students who complete the graduate math certificate and the advanced graduate math certificate meet the HLC guidelines to be dual credit instructors.

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| --- | --- | --- | --- | --- |
| **Prefix** | **Number** | **Course Title**  *(add or delete rows as needed)* | **Credit Hours** | **New**  **(yes, no)** |
| MATH | 513 | Abstract Algebra I | 3 | Yes |
| MATH | 561 | Geometry | 3 | Yes |
| MATH | 571  575  622 | Numerical Analysis I, **OR**  Operations Research, **OR**  Difference Equations | 3 | Yes |
| Yes |
| Yes |
|  |  | Subtotal | 9 |  |

Although Math 513, 561, 571, and 575 are listed as new courses, these are crosslisted courses that DSU teaches at the 300 – 400-level. These are traditional content courses with content to extend the knowledge of participants into areas that are relevant to their position as high school math teachers. Difference equations can be interpreted as the discrete version of differential equations and it is unlikely that any participants have seen the content of this course which will improve their understanding of calculus (as well as algebraic and trigonometric manipulations), in particular rates of change and sums of rates of change being total change. In short, these courses will improve the content knowledge of participants in areas that are relevant to the teaching of high school mathematics.

1. **Student Outcome and Demonstration of Individual Achievement. [[3]](#footnote-3)**
   1. **What specific knowledge and competencies, including technology competencies, will all students demonstrate before graduation**? *The knowledge and competencies should be specific to the program and not routinely expected of all university graduates.*

Individual Student Outcomes:

Understand operations on sets and their properties;

Understand axiomatic foundation of Euclidean Geometry;

Mastery of fundamental geometric principles;

Mastery of fundamental algebraic principles;

Understand analytic techniques used to solve problems;

Produce logically sound arguments;

Ability to solve problems;

Ability to communicate mathematical solutions.

* 1. **Complete Appendix A – Outcomes using the system form.** *Outcomes discussed below should be the same as those in Appendix A.*

1. **Complete the following charts to indicate if the university intends to seek authorization to deliver the entire certificate at any off-campus location (e.g., UC Sioux Falls, Capital University Center, Black Hills State University-Rapid City, etc.) or intends to seek authorization to deliver the entire certificate through distance technology (e.g., as an on-line program)?**[[4]](#footnote-4)

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|  | **Yes/No** | ***If Yes, list location(s), including the physical address*** | ***Intended Start Date*** |
| **Off-campus** | No |  | Click here to enter a date. |

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|  | **Yes/No** | ***If Yes, identify delivery methods*** | ***Intended Start Date*** |
| **Distance Delivery** | Yes | online | 8/15/2019 |

1. **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.*

Note – the HLC requirement to be a dual credit instructor is to have a master’s degree and if the masters degree is not in the content area then the instructor must have 18 graduate content credits in the discipline being taught which is why we have requested two 9-credit graduate mathematics certificates.

Appendix A

**Individual Student Outcomes and Program Courses**

*List specific individual student outcomes—knowledge and competencies—in each row. Label each column with a course prefix and number. Indicate required courses with an asterisk (\*). Indicate with an X the courses that will provide the student with an opportunity to acquire the knowledge or competency listed in the row. All students should acquire the program knowledge and competencies regardless of the electives selected. Modify the table as necessary to provide the requested information for the proposed program.*

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| --- | --- | --- | --- |
| **Individual Student Outcomes and Program Courses** | | | |
| List specific individual student outcomes—knowledge and competencies—in each row. Label each column with a course prefix and number. Indicate required courses with an asterisk (\*). Indicate with an X the courses that will provide the student with an opportunity to acquire the knowledge or competency listed in the row. All students should acquire the program knowledge and competencies regardless of the electives selected. Modify the table as necessary to provide the requested information for the proposed program. | | | |
| **Individual Student Outcome** | **MATH 513\*** | **MATH 561\*** | **MATH 571, 575, 622** |
| Understand operations on sets and their properties | X |  |  |
| Understand axiomatic foundation of Euclidean Geometry |  | X |  |
| Mastery of fundamental geometric principles |  | X |  |
| Mastery of fundamental algebraic principles | X |  |  |
| Understand analytic techniques used to solve problems |  |  | X |
| Produce logically sound arguments | X | X | X |
| Ability to solve problems | X | X | X |
| Ability to communicate mathematical solutions | X | X | X |

1. For workforce related information, please 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. [↑](#footnote-ref-1)
2. Regental system certificate programs typically are a subset of the curriculum offered in degree programs, include existing courses, and involve 9-12 credits for completion. Deviations from these guidelines require justification and approval. [↑](#footnote-ref-2)
3. Board Policy 2:23 requires certificate programs to “have specifically defined student learning outcomes.” [↑](#footnote-ref-3)
4. The accreditation requirements of the Higher Learning Commission (HLC) require Board approval for a university to offer programs off-campus and through distance delivery. [↑](#footnote-ref-4)