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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:** | **Introductory 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 teaching six 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 masters degree or are enrolled in a masters degree program 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 first three graduate math courses proposed in this request will earn the student an Introductory Graduate Mathematics Certificate.

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 Master’s 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.

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 as a result 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 so their high school students can earn college credit from courses offered within the high school. 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 mathematis teachers that have both a master’s degree and 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 high school math teacher with 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” it was 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 has created a larger pool of teachers that are 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 Introductory Graduate Mathematics Certificate and the Advance Graduate Mathematics Certificate are programs (each has 9 graduate math credits) designed for current high school mathematics teachers that are either enrolled in or have completed a master’s degree that would like to become cconcurrent dual credit math instructors and need the 18 credit hours of gradate math content to meet HLC guidelines.

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 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 introductory graduate math certificate and the advanced graduate math certificate, a student would need to complete 18 graduate credit hours in mathematics meeting the HLC guidelines for being a dual credit math instructor (provided the student already has a master’s degree). Following are the courses required in the DSU Graduate Mathematics Certificate, however any graduate math content or stat content course in the SDBOR system or acceptable transfer course can be used to replace one of these courses using the substitution process. Note, it must be a math content course so that students who complete the introductory 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 | 509 | Foundational Mathematics | 3 | No |
| MATH | 536 | Number Theory and Cryptography | 3 | Yes |
| MATH | 537 | Cryptography and Codes | 3 | Yes |
|  |  | Subtotal | 9 |  |

Math 436/536 and 437/537 are courses that have algebraic and number theory content with real world applications to cryptography and coding being key components of the courses. These courses are necessary to enhance the content knowledge of participating teachers and give them experience using this abstract knowledge in real world scenarios. These courses fit the mission of Dakota State University and are courses that are utilized in other programs.

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:

Mastery of fundamental knowledge of mathematics in particular sets, logic and logical arguments;

Understands elementary number theoretic arguments and their roles in cryptographic techniques;

Understands algebraic structure and how the structure is used in cryptographic techniques;

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.*

|  |  |  |  |
| --- | --- | --- | --- |
| **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 509\*** | **MATH 536\*** | **MATH 537\*** |
| Mastery of fundamental knowledge of mathematics in particular sets, logic and logical arguments | X |  |  |
| Understands elementary number theoretic arguments and their roles in cryptographic techniques |  | X |  |
| Understands algebraic structure and how the structure is used in cryptographic techniques |  |  | 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)