

NEW PROGRAM PROPOSAL FORMSponsoring Institution(s): Northwest Missouri State UniversityProgram Title: MS in MathematicsDegree/Certificate: Master of Science

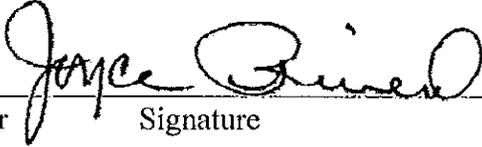
Options:

Delivery Site(s): Maryville Campus
Northwest Kansas City Center
Northwest St. Joseph Center

CIP Classification: 270101 (Please provide a CIP code)Implementation Date: January 12, 2015

Cooperative Partners:

Expected Date of First Graduation: May 2016**AUTHORIZATION**

Joyce Piveral, Interim Provost  June 26, 2014
 Name/Title of Institutional Officer Signature Date

Gregory Haddock, Vice Provost (660) 562-1145
 Person to Contact for More Information Telephone

1. Form OS - Off-Site Delivery of an Existing Program

OFF-SITE DELIVERY OF AN EXISTING PROGRAM FORM

Sponsoring Institution (s): Northwest Missouri State University

Program Title: MS in Mathematics

Degree/Certificate: Master of Science

Institution Granting Degree: Northwest Missouri State University

Delivery Site(s): Maryville (main) Campus
Northwest Kansas City Center
Northwest St. Joseph Center

Mode of Program Delivery: To accommodate the fast changing land scape of higher ducation, the courses in the proposed program would be amenable to multiple delivery formats. This includes online, blended, or distance delivery systems.

Geographic Location of Student Access:

Northwest Kansas City Center, 2601 N.E. Barry Road, CB-111, Kansas City, MO 64156

Northwest St. Joseph Center, Suite 100 South, 3500 N. Village Dr., St. Joseph, MO 64506

CIP Classification: 270101 (Please provide a CIP code)

Implementation Date: Spring 2015
(Semester and Year)

Cooperative Partners:

AUTHORIZATION

Joyce Piveral, Interim Provost
Name/Title of Institutional Officer



Signature

June 26, 2014
Date

1. Form OS - Off-Site Delivery of an Existing Program

Gregory Haddock, Vice Provost
Person to Contact for More Information

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Telephone

Student Demand:

i. Estimated enrollment each year for the first five years for full-time and part-time students (Please complete Form SE.)

<i>Year</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Full-time</i>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
<i>Part-time</i>	<u>5</u>	<u>7</u>	<u>10</u>	<u>10</u>	<u>10</u>
<i>Total</i>	<u>5</u>	<u>7</u>	<u>10</u>	<u>10</u>	<u>10</u>

ii. Will enrollment be capped in the future?

There are no plans to cap enrollment.

What method(s) or data were used to project student enrollment for this proposed program?

The market survey conducted by the Kansas City and St. Joseph centers provided this data.

A. Market Demand:

. National, state, regional, or local assessment of labor need for citizens with these skills

The degree would provide training in newly developing trends in various related fields including specialized and in-depth training in newly emerging areas such as data mining, training in new advancements in instructional technology, mathematics curriculum development, and the latest trends in computer science. The proposed MS program includes appropriate coursework addressing these areas. Education is continuously adapting to new technological advancement. There is a need for retraining in the newest technological tools and ideas.

There is also a niche to provide high school teachers with credentials to teach dual credit in secondary mathematics and train them to incorporate and increase STEM teaching in their curriculum. Initial market tests have shown encouraging demands for the package included in our newly proposed program.

Specifically, high school mathematics teachers are demanding more and more content-based education courses that address the teaching of mathematics from a specialist perspective in particular, as opposed to a general approach that addresses education from a generalist perspective. Our existing program does not allow us to address this need. The new program was also needed because alumni of Northwest had often taken SOD-level mathematics courses as part of

their electives in their B.S.Ed. degree, and this posed a problem when creating a program that fit well with courses other students might have taken. (For example, we tried to get a cohort of 15 people, but for several courses, only 9 or 10 students needed to take them, which did not meet the standard for offering the course.) The blended course delivery option will allow Northwest to utilize its outreach partnership with Metropolitan Community College to serve the high school teachers of Kansas City.

B. Societal Need:

i. General needs which are not directly related to employment

The new program would be accessible to a diverse, audience and will serve both mathematicians working in the private sector and mathematics educators working in PK-12 schools. To accommodate the fast changing land scape of higher education, the courses in the proposed program would be amenable to multiple delivery formats. This includes online, blended, or distance delivery systems. This new program meets the department goal of providing training in newly developing trends in mathematics as well as various related fields such as data mining, instructional technology and mathematics curriculum development.

C. Methodology used to determine "B" and "C" above.

Prospective students in the Kansas City and St. Joseph regions were surveyed regarding their interest in a program that would be offered in a flexible mixed-delivery model. Current students and prospective students on campus have indicated a desire to have more mathematics content, and not educational content (therefore, an MS degree, and not an MEd teacher preparation degree).

Every year many school districts advertise for mathematics teachers and are not able to fill positions and consequently hire less prepared teachers. This also includes districts that want to offer dual credit mathematics courses for which teachers need at least 18 credits of graduate level mathematics. Private businesses are advertising for trained individuals in data mining and information technology.

The latest results of the Programme for International Student Assessment show the mediocre performance of US high school students. This shows that the US needs more STEM teachers who are prepared to teach mathematics in the high schools. This new program will also help meet the need for statisticians trained in data mining and information technology. This new program will promote alternative delivery types of education for professionals such as blended instructional television, internet, and face to face modes.

3. Duplication and Collaboration: (Form CL – Collaborative Programs)

If similar programs currently exist in Missouri, what makes the proposed program necessary and/or distinct from the others at public institutions, area vocational technical schools, and private career schools?

This new program will serve a new market in a wider geographical area for both professional mathematicians as well as high school mathematics teachers. There is a demand for this program as indicated by a market analysis and survey conducted by the Northwest Centers in Kansas City and St. Joseph. The market demand for mathematics teachers in secondary schools is well documented by the shortage of appropriately prepared mathematics teachers, and the national shortage of STEM teachers. There is also a demand for training in new tools in instructional technology and data mining.

This new program could very well be offered by a consortium of graduate schools across Missouri.

Does delivery of the program involve a collaborative effort with any external institution or organization?

No (If yes, please complete Form CL.)

3. Program Structure: (Form PS - Program Structure)

PROGRAM STRUCTURE

A. Total credits required for graduation: 32

B. Residency requirements, if any: NA

C. General education: Total credits: NA

Courses (specific courses OR distribution area and credits):

D. Major requirements: Total credits: 24

Required Courses 24

<u>Math 17-602 Introduction to Higher Mathematics</u>	<u>3</u>
<u>Math 17-652 Analytic Geometry</u>	<u>4</u>
<u>Math 17-643 Mathematical Analysis with Applications</u>	<u>4</u>
<u>Math 17-617 Combinatorics</u>	<u>4</u>
<u>Math 17-618 Number Theory</u>	<u>4</u>
<u>Math 17-639 Data Analysis</u>	<u>4</u>
<u>Math 17-624 Research Project</u>	<u>1</u>

8 Hours of Advisor Approved Electives From the Following Areas

- Computer Science
- Data Mining
- Instructional Technology
- Mathematics Pedagogy

E. Free elective credits: 8 (Sum of C, D, and E should equal A.)

F. Requirements for thesis, internship or other capstone experience:

The content of the comprehensive examination will be equally divided between those courses offered in the Required courses and the list of electives. The Department of MCSIS is responsible for the scheduling, construction, and evaluation of their respective portions of the comprehensive examination. The degree candidate must pass both portions of the examination.

G. Any unique features such as interdepartmental cooperation:

Data Mining may collaborate with faculty from the Computer Science fields.

5. Program Characteristics and Performance Goals: (Form PG).

PROGRAM CHARACTERISTICS AND PERFORMANCE GOALS

Institution Name: Northwest Missouri State University

Program Name: MS in Mathematics

Date: June 27, 2014

(Although all of the following guidelines may not be applicable to the proposed program, please carefully consider the elements in each area and respond as completely as possible in the format below. Quantification of performance goals should be included wherever possible.)

Student Preparation

- Any special admissions procedures or student qualifications required for this program which exceed regular university admissions, standards, e.g., ACT score, completion of core curriculum, portfolio, personal interview, etc. Please note if no special preparation will be required.

Option 1. Students with a minimum undergraduate GPA of 2.75 and composite score of 280 or higher on the verbal and quantitative sections of the GRE General Test will be accepted. The official score must be filed with the Graduate Office prior to admission but no later than the end of the first trimester of enrollment. If the score is not submitted by the end of the first academic trimester, the student cannot re-enroll until the score is submitted. Students who do not meet the cutoff score of 280 may be accepted on the condition that they maintain a grade point average of at least 3.00 for the first nine graduate hours in mathematics.

Option 2. Undergraduate mathematics majors within fewer than 30 hours of completing their B.S. in mathematics, with GPA of 2.8 overall and 3.2 in mathematics may apply for a "fast track" admission to the program. Students in this option can complete their B.S. and M.S. in Mathematics in 5 years.

- Characteristics of a specific population to be served, if applicable.

The students in this program will be graduate students with previous mathematics experience. They may, or may not, be current educators.

Faculty Characteristics

- Any special requirements (degree status, training, etc.) for assignment of teaching for this degree/certificate.

Faculty are full-time with Graduate Faculty status, terminal degrees.

- Estimated percentage of credit hours that will be assigned to full time faculty. Please use the term "full time faculty" (and not FTE) in your descriptions here.

5. Program Characteristics and Performance Goals: (Form PG).

This program will require one or two faculty members to teach the graduate level mathematics courses during the fall, spring, and summer terms. This will be 100% Northwest faculty, not adjunct.

- Expectations for professional activities, special student contact, teaching/learning innovation.

A graduate faculty member from the mathematics/mathematics education area will serve as area advisor, and her/his signature will be required for the Approved Program Form. Any change in an Approved Program Form must be initiated by the student and be submitted to the Graduate Office accompanied by written approval from advisors.

The content of the comprehensive examination will be equally divided between those courses offered in the required courses and the list of electives. The Department of MCSIS is responsible for the scheduling, construction, and evaluation of their respective portions of the comprehensive examination. The degree candidate must pass both portions of the examination.

Enrollment Projections

- Student FTE majoring in program by the end of five years.
Twenty students in five years
- Percent of full time and part time enrollment by the end of five years.
All students will be part-time students.

Student and Program Outcomes

- Number of graduates per annum at three and five years after implementation.
10 per annum at both 3 and 5 years.
- Special skills specific to the program.
The students in this program will be graduate students with previous mathematics experience.
- Proportion of students who will achieve licensing, certification, or registration.
Roughly one-half to two-thirds will be certified instructors, but this program will not lead to further certification, nor will this program be helpful for an uncertified teacher to gain certification.
- Performance on national and/or local assessments, e.g., percent of students scoring above the 50th percentile on normed tests; percent of students achieving minimal cut-scores on criterion-referenced tests. Include expected results on assessments of general education and on exit assessments in a particular discipline as well as the name of any nationally recognized assessments used.
N/A
- Placement rates in related fields, in other fields, unemployed.

5. Program Characteristics and Performance Goals: (Form PG).

This could help an instructor find further employment with higher mathematics ability needs.

- Transfer rates, continuous study.

N/A

6. Program Accreditation

- Institutional plans for accreditation, if applicable, including accrediting agency and timeline. If there are no plans to seek specialized accreditation, please provide reasons.

Program will not be separately accredited.

Alumni and Employer Survey

- Expected satisfaction rates for alumni, including timing and method of surveys
Expected satisfaction is to be high. The faculty are providing this program based on desires expressed by prospective students over the past two years.
- Expected satisfaction rates for employers, including timing and method of surveys
School districts have a strong desire to offer dual enrollment opportunities to students. This program will give the background needed for HS faculty to be fully eligible to participate in such practice.

7. Institutional Characteristics: Please describe succinctly why your institution is particularly well equipped or well suited to support the proposed program.

Based on the long-standing MEd program in Teaching: Mathematics, the faculty are well aware of the needs of graduate students. This is not a pedagogy degree, but several faculty members do have that background. Also, we have faculty that have a pure mathematics background that will contribute to this program.

8. Any Other Relevant Information:

proposed catalog copy attached as Appendix A.

Catalog (Proposed)

M.S. in Mathematics

Required Courses	24
Math 17-602 Introduction to Higher Mathematics	3
Math 17-652 Analytic Geometry	4
Math 17-643 Mathematical Analysis with Applications	4
Math 17-617 Combinatorics	4
Math 17-618 Number Theory	4
Math 17-639 Data Analysis	4
Math 17-624 Research Project	1

8 Hours of Advisor Approved Electives From the Following Areas

- Computer Science
- Data Mining
- Instructional Technology
- Mathematics Pedagogy

Requirements Beyond the Course Work for This Advanced Degree:

Two comp exams (subject chosen by student) must be passed in order to graduate.

Program Admission Requirements

Option 1. Students with a minimum undergraduate GPA of 2.75 and composite score of 280 or higher on the verbal and quantitative sections of the GRE General Test will be accepted. The official score must be filed with the Graduate Office prior to admission but no later than the end of the first trimester of enrollment. If the score is not submitted by the end of the first academic trimester, the student cannot re-enroll until the score is submitted. Students who do not meet the cutoff score of 280 may be accepted on the condition that they maintain a grade point average of at least 3.00 for the first nine graduate hours in mathematics.

Option 2. Undergraduate mathematics majors within fewer than 30 hours of completing their B.S. in mathematics, with GPA of 2.8 overall and 3.2 in mathematics may apply for a "fast track" admission to the program. Students in this option can complete their B.S. and M.S. in

Mathematics in 5 years.

Advisement

A graduate faculty member from the mathematics/mathematics education area will serve as area advisor, and her/his signature will be required for the Approved Program Form. Any change in an Approved Program Form must be initiated by the student and be submitted to the Graduate Office accompanied by written approval from advisors.

Comprehensive Examination

The content of the comprehensive examination will be equally divided between those courses offered in the Required courses and the list of electives. The Department of MCSIS is responsible for the scheduling, construction, and evaluation of their respective portions of the comprehensive examination. The degree candidate must pass both portions of the examination.

Course Descriptions

17-602 Introduction to Higher Mathematics (3 credit hours)(Summer, first year)

This course is a survey of topics designed to review concepts that include series, differentiation, integration, functions of several variables, maximum and minimum problems, logic, induction, probability, and matrices.

17-617 Combinatorics (4 credit hours)(Summer, second year)

Introduction to sets and their properties, functions, finite and infinite sets. Introduction to fundamental techniques in enumeration, discrete structures, and algorithms and optimization.

17- 639 Data Analysis (4 credit hours)(Spring, second year)

This course is designed to explain what data mining is all about and show how to use data mining techniques effectively in practice. It will be a practical, hands-on introduction to the statistical methods based on case-studies. It provides an introduction and encouragement for more advanced work on real big data. Although the mathematics behind the methodologies used will be explained, the focus will be on the practical issues of getting results out of data mining. Some knowledge of statistical modeling, especially regression techniques will be useful.

17-652 Analytic Geometry (4 credit hours)(Fall, first year)

This is a content course where students will deepen their knowledge and appreciation of geometry. Topics may include transformation geometry, taxicab geometry, parametric equations, polar coordinates, conic sections, and famous theorems in geometry.

17-618 Number Theory (4 credit hours)(Fall, second year)

This is a standard course in classical number theory. Topics include divisibility, congruence, theory of quadratic residues, and Diophantine analysis.

17-643 Principles of Mathematical Analysis and Applications (4 credit hours)(Spring first year)

Topics include sequence and series, continuity, differentiability, integration of functions of one real variable and functions of one complex variable. Applications to engineering and modeling problems will be presented.

Appendix A – Catalog Copy

17-667 Workshop on Connections and Modeling (1 credit hour)(Fall, first year)

An exploration of the connections between mathematical domains and between mathematics and other disciplines. Differentiated strategies to embed the connective process and infuse multiple representations in instruction will be examined.

17-668 Workshop in Reasoning and Sense Making (1 credit hour)(Spring, first year)

An exploration of curriculum and differentiated instructional approaches to help all students make reasoning and sense-making foundational to the content that is being taught.

17-669 Workshop in Proof and Justification(1 credit hour)(Spring, second year)

An exploration of the nature and role of proof and “proving” in mathematics including an understanding of the forms of proof and the nature of argumentation and justification. Strategies to help all students create viable justifications will be examined.