

**Office of the President  
California State University, Chico**



**Executive Memorandum 18-014**

**May 30, 2018**

**From:** Gayle E. Hutchinson, President

**Subject:** New Minor in Mathematics Education

Upon the recommendation of the Academic Senate and the concurrence of the Provost, I approve the addition of a New Minor in Mathematics Education in the Department of Mathematics and Statistics within the College of Natural Sciences. The total number of units required for the minor will be 26-27 and it will be effective in fall 2019.

<b>Policy Title:</b>	EM 18-014 New Minor in Mathematics Education
<b>Contact:</b>	Department of Mathematics and Statistics
<b>Supersedes:</b>	
<b>Revision:</b>	
<b>Enabling Legislation or Executive Order:</b>	

# New Minor Signature Form

Minor Name: Mathematics Education

**Department Contact(s) w/phone #(s):**

M.E. Matthews x5469  
Lisa Washburn x6111

### Required Signatures

The Department of Mathematics and Statistics  
has reviewed and approved this new minor

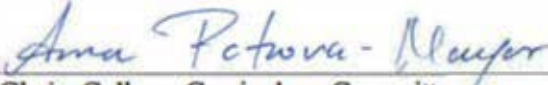
  
\_\_\_\_\_  
Chair, Department Curriculum Committee

04/18/17  
Date

  
\_\_\_\_\_  
Department Chair

4/18/17  
Date

The College of Natural Sciences  
has reviewed and approved this new minor

  
\_\_\_\_\_  
Chair, College Curriculum Committee

5-03-17  
Date

  
\_\_\_\_\_  
College Dean

OCT 16 2017  
Date

Send signature page with proposal attached to Curriculum Services at  
Undergraduate Education, zip 128

Curriculum Review Completed

2/26/18  
Date

Note: The department will be notified on the of dates for EPPC, Academic Senate, and Chancellor's Office (if applicable) review and number of copies needed.

OSU Chico  
Curriculum Services

OCT 18 2017

RECEIVED

## Proposal for a New Minor – April 2017

- I. Proposed title of new minor.  
**Mathematics Education**
- II. Academic year of intended implementation.  
2019-2020
- III. Name of the department and college submitting the proposal; identify unit with primary responsibility for the minor.  
Department of Mathematics and Statistics
- IV. Statements on questions of need and demand.
  - A. Relation of the minor to the University Strategic Plan.

The main purpose of this minor is to develop highly qualified teachers of middle school mathematics. Many students leave the Mathematics Education focus in the B.S. in Mathematics because they are overwhelmed by the coursework, and other students begin as Liberal Studies majors only to realize they would prefer to teach middle school mathematics. Many of the students who leave the B.S. in Mathematics are students of color, first generation students, or are otherwise underrepresented minorities. This minor will include a pathway for these students to qualify to apply to a credential program in Foundational Level Mathematics and teach grades 6-10 mathematics.

This minor will serve the University Strategic Plan by “employing ‘student-friendly’ policies and practices that foster student achievement and progress to degree” by enabling students who have left the major to earn a minor that will allow them to reach their career goals and also by requiring courses that may support a more successful return to the major. The minor will also support the “values of multicultural respect, awareness, and understanding” by giving access to a career path to those students whose backgrounds and high schools may not have prepared them for success in the mathematics major. These future teachers will then better serve their communities and in turn better prepare our future students.

Finally, there is a dire shortage of mathematics teachers in the state and in the region. Strategic Priority #4 states that we believe “in the value of service to others, [and so] we will continue to serve the educational, cultural, and economic needs of Northern California.” The preparation of highly qualified teachers is a fundamental service that Chico State has provided since its creation as a Normal School. We can benefit the larger



North State community while also supporting our undergraduates in reaching their career goals.

B. Need for the proposed minor.

California is in a dire teacher shortage, particularly in rural and urban areas, and nearly 2/3 of the students at Chico State who enroll in the B.S. in Mathematics in the area of Mathematics Education leave the major, about 1/2 leaving within the first two years of the degree program and another 1/6 in the 3<sup>rd</sup> and 4<sup>th</sup> years. Many of the students who leave the major still wish to teach mathematics, but they feel the barrier is too great. This minor will allow those students to use some of the course work they have taken and to take some additional which will prepare them for a FLM credential program. Students who are currently preparing to teach K-8 in the LBST major will also be able to use their coursework toward the minor and show prospective employers the completion of a minor focused on mathematics.

This minor could also allow for those students completing undergraduate waiver programs in science to earn both science and mathematics credentials. This is a sensible pathway seeing as many middle school teachers of science also teach mathematics, especially in the rural schools of the North State.

C. Identify other closely related curricula currently offered by the campus.

1. Explain the impact the proposed minor will have on these programs.

The Mathematics Education pathway of the B.S. in Mathematics requires a number of the courses in this program. However, because this program is not a major, it is not expected that students who would otherwise complete the major would opt for this program instead. This minor should allow Chico State to retain and train future teachers (who have already been leaving the major) without decreasing enrollment in the major.

2. Explain how current programs do not meet the proposed minor's objectives.

The major in Mathematics in the Mathematics Education pathway requires coursework that is unnecessary to meet the California Commission on Teacher Credentialing requirements for a waiver program for Foundational Level Mathematics (grades 6-10). This can bar entry to the teaching profession from otherwise qualified teaching candidates. No other program on

campus exists to support training teachers for middle grades math credential programs.

D. Student demand for the minor.

We have had enrollment of 5-8 students in each of our courses as pilots when the courses did not themselves serve to apply toward a degree program. We have had more interest, but students have wanted the courses to apply for some program. From those students who left the BS in Mathematics, we would expect to retain 8-10 students in the minor each year. Given that the LBST Area of Concentration in Mathematics is the highest enrolled AoC, we expect 8-10 students from that program each year. We would also hope to see 2-4 students each year who are completing other science-based majors but decide to pursue teaching middle grades mathematics without completely changing their major.

V. Resources

A. List the faculty members for the required courses in the minor by

Jorgen Berglund  
Full Professor  
Full-time  
Ph.D.  
1997 Mathematics  
Trainer of pre-service teachers and professional development provider for in-service teachers, focus on development of mathematical content knowledge

M.E. Matthews  
Assistant Professor  
Full-time  
Ed.D.  
2014 Mathematics Education  
Trainer of pre-service teachers and professional development provider for in-service teachers, focus on development of mathematical content knowledge

B. List the faculty members for the elective courses in the minor by

Name  
Rank  
Appointment status  
Highest degree earned

Same as above



- C. List the resources needed to sustain the program for the first five years, including cost and funding source.

Faculty – first two years will be covered by the PRISMS/NGMT Grant

Staff – program recruiter covered by PRISMS/NGMT grant

Facilities – None needed

Library resources – None needed

Equipment – None needed

Specialized material – None needed

- D. Additional support resources required, including source of support.  
None needed

## VI. Curriculum

Note: Proposed curriculum should take advantage of courses already offered in other departments when subject matter would otherwise overlap or duplicate existing course content.

- A. Total number of units required for the minor.

26-27

- B. List all new courses for the proposed program.

1. Course number and title

Units of credit

Prerequisites

Proposed catalog description

Mode of course delivery if other than regular

### Math 125 – Advanced Number and Operation

- Units of credit: 3
- Prerequisites: Successful completion of high school precalculus or Math 310
- Proposed catalog description: Investigate number and operation through calculation and abstraction, find patterns and relationships through computation, develop and test mathematical conjectures, and develop an appreciation of proof and an ability to make mathematical arguments. Basic concepts from Number Theory will be explored, culminating in proof of the Fundamental Theorem of Arithmetic and related theorems in other number sets.

### Math 225 – Advanced Algebraic Reasoning

- Units of credit: 3
- Prerequisites: Math 125
- Proposed catalog description: Investigate the Gaussian Integers as an extension of concepts covered in 125. Perform operations on complex numbers and represent

complex numbers and their operations on the complex plane. Understand and apply the basic properties and operations of matrices and determinants. Model and solve problems using linear equations, pairs of simultaneous linear equations, and their graphs

2. Identify the new courses needed to initiate the program.  
Math 125  
Math 225
3. Identify the new courses needed during the first two years after implementation.  
None

- C. List all required courses for the minor.  
Course number and title  
Units of credit  
Prerequisites

**Choose one of the two pathways:**

MATH 120	Analytic Geometry and Calculus	4.0	FS	GE
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*Prerequisites: Completion of ELM requirement; both MATH 118 and MATH 119 (or high school equivalent); a score that meets department guidelines on a department administered calculus readiness exam must be achieved by those who claim high school equivalence.*

and

MATH 121	Analytic Geometry and Calculus	4.0	FS	
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*Prerequisites: MATH 120.*

or

MATH 110	Concepts and Structures of Mathematics	3.0	FS	GE
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*Prerequisites: Completion of ELM requirement.*

and

MATH 210	Concepts and Structures of Mathematics	3.0	FS	
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*Prerequisite: MATH 110.*

and

MATH 310	Patterns and Structures in Mathematics	3.0	FS	
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*Prerequisites: MATH 110, MATH 210.*

**12 units required**

Math 125	Advanced Number and Operation (new)	3.0	FA	
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*Prerequisites: High school precalculus or Math 310*

Math 225    Advanced Algebraic Reasoning (new)    3.0    SP  
*Prerequisites: Math 125*

Math 341    Mathematical Topics for the Credential    3.0    FA  
*Prerequisites: Math 121 \*\* (will need to be modified for program)*

Math 342    Math Topics for the Credential    3.0    SP  
*Prerequisites: Math 341*

**1 course selected from**

MATH 105    Statistics    3.0    FS    GE

*Prerequisites: Completion of ELM requirement.*

MATH 305    Conceptual and Practical Statistics    3.0    SP

*Prerequisites: MATH 120 or MATH 109 (may be taken concurrently).*

**1 course selected from**

MATH 311    Intuitive Foundations of Geometry    3.0    SP

*Prerequisites: MATH 110, MATH 210.*

MATH 346    College Geometry    3.0    SP

*Prerequisites: MATH 220, MATH 330.*

D. List all elective courses for the minor.

Course number and title

Units of credit

None.

E. Explain provisions for articulation of the proposed minor with community college courses.

Math 120 and Math 121 articulate with common Calculus I and II courses.

Math 110 articulates with common course Math 120.

Math 105 articulates with an introductory course in statistics.

F. Complete catalog copy, including admission and completion requirements.

See the current University Catalog for correct format; please follow it exactly. Before the proposal is submitted to Academic Affairs, it may be helpful to review catalog copy with Academic Publications.



Attach the New Minor *signature* form to the front of the proposal and submit to Academic Affairs after all department and college reviews are complete.

# The Minor in Mathematics Education

## Course Requirements for the Minor: 26-27 units

The following courses, or their approved transfer equivalents, are required of all candidates for this minor.

### Choose one of the two pathways (8-9 units):

MATH 120 Analytic Geometry and Calculus 4.0 FS GE

*Prerequisites: Completion of ELM requirement; both MATH 118 and MATH 119 (or high school equivalent); a score that meets department guidelines on a department administered calculus readiness exam must be achieved by those who claim high school equivalence.*

and

MATH 121 Analytic Geometry and Calculus 4.0 FS

*Prerequisites: MATH 120.*

or

MATH 110 Concepts and Structures of Mathematics 3.0 FS GE

*Prerequisites: Completion of ELM requirement.*

and

MATH 210 Concepts and Structures of Mathematics 3.0 FS

*Prerequisite: MATH 110.*

and

MATH 310 Patterns and Structures in Mathematics 3.0 FS

*Prerequisites: MATH 110, MATH 210.*

### 12 units required

Math 125 Advanced Number and Operation (new) 3.0 FA

*Prerequisites: High school precalculus or Math 310*

Math 225 Advanced Algebraic Reasoning (new) 3.0 SP

*Prerequisites: Math 125*

Math 341 Mathematical Topics for the Credential 3.0 FA

*Prerequisites: Math 121 \*(will need to be modified for program)*

Math 342 Math Topics for the Credential 3.0 SP

*Prerequisites: Math 341*

**1 course selected from (3 units)**

MATH 105 Statistics 3.0 FS GE

*Prerequisites: Completion of ELM requirement.*

MATH 305 Conceptual and Practical Statistics 3.0 SP

*Prerequisites: MATH 120 or MATH 109 (may be taken concurrently).*

**1 course selected from (3 units)**

MATH 311 Intuitive Foundations of Geometry 3.0 SP

*Prerequisites: MATH 110, MATH 210.*

MATH 346 College Geometry 3.0 SP

*Prerequisites: MATH 220, MATH 330.*

**To Apply for a Minor**

To apply for a minor, you must fill out a Declaration of Minor form, available from the [Office of the Registrar - Plan form](#) website and take to the Mathematics and Statistics Department, HOLT 181, for the Chair's signature. Before choosing any options for the minor, you must obtain approval from the department chair.