OFFICE OF CHIEF OPERATIONS OFFICER
Summary of State Board of Education Agenda Items
August 14-15, 2014

OFFICE OF EDUCATOR LICENSURE

11. <u>Approval of request from the University of Southern Mississippi for a supplemental endorsement in secondary mathematics as recommended by the Commission on Teacher and Administrator Education, Certification and Licensure and Development</u>

    <u>Background Information</u>:

    The University of Southern Mississippi proposes to offer a new secondary mathematics supplemental endorsement program that would replace the currently existing program if approved by the state. This program is intended to provide an adequate level of advanced mathematics preparation required to teach mathematics at the high school level as outlined by the *Common Core Standards for Mathematics*.

    The proposed program will ensure that those education majors who seek add-on mathematics endorsement have adequate content knowledge to teach the high school level mathematics effectively. The proposed program is in line with the recommendations of the Mississippi Teacher Educators (MAMTE) organization as well as similar programs in Mississippi (in particular that of the University of Mississippi) and other southern states.

    The Mississippi Department of Education recently amended the policy for obtaining secondary mathematics supplemental endorsement from any 21 hours of mathematics coursework to an approved program of study. By completing a prescribed program of mathematics coursework, teachers will be better prepared to meet the expectations of the *Common Core State Standards for Mathematics* and to help Mississippi students become college and career ready.

    The Commission on Teacher and Administrator Education, Certification and Licensure and Development approved the request on July 11, 2014.

    Recommendation: Approval

    Back-up material attached

Office of Teacher and Administrator Preparation
Mississippi Department of Education
359 N. West Street/P.O. Box 771
Jackson, MS 39205-0771
601.359.3631

EDUCATION PROGRAM APPROVAL REQUEST FORM

Institution: University of Southern Mississippi **Date Submitted:** 5/23/14

Submitted by: Dr. Patricia Biesiot **Commission Approval Date:_____**

Dean, College of Science and Technology **State Board Approval Date: _____**

Proposed date of Program Implementation: Academic Year 2014 - 2015

Proposal Request and Support Materials are provided for the approval to implement:
____ New Program __x_ Modifications to Existing Program ____ Licensure Requirement

In addition to your <u>current education program course list/description</u>, you must provide: 1) a copy of the <u>proposed new program</u>; 2) the current program with <u>clear indication of proposed modifications</u>; 3) any <u>evidence of</u> institutions (state, regional or national) with the <u>same or a similar course of study</u>; 4) evidence of <u>qualified faculty</u>; and 5) any other documentation that further supports the proposal.

Please state your specific request:

The University of Southern Mississippi would like to offer a new Secondary Mathematics Supplemental Endorsement program that would replace the currently existing program if approved by the state. This program is intended to provide an adequate level of advanced mathematics preparation required to teach mathematics at the high school level as outlined by the *Common Core Standards for Mathematics*. The proposed program will ensure that those education majors who seek add-on mathematics endorsement have adequate content knowledge to teach the high school level mathematics effectively. The proposed program is in line with the recommendations of the Mississippi Teacher Educators (MAMTE) organization as well as similar programs in Mississippi (in particular that of the University of Mississippi) and other southern states.

State rationale:

The MDE recently amended the policy for obtaining Secondary Mathematics Supplemental Endorsement from any 21 hours of mathematics coursework to an approved program of study. By completing a prescribed program of mathematics coursework, teachers will be better prepared to meet the expectations of the *Common Core State Standards for Mathematics* and to help Mississippi students become college and career ready.

NOTE: Program approval is subject to standard review procedures that involve several entities and, therefore, timelines for final approval by the Office of Teacher and Administrator Preparation (TAP) may vary. After TAP approves the

program, if it is a new or modified program or requires licensure changes, it may then be subject to approval by the Licensure Commission on Teacher and Administrator Education, Certification and Licensure and Development and the State Board of Education before candidates are eligible for Mississippi Teacher Licensure.

Patricia M. Biesiot

THE UNIVERSITY OF
SOUTHERN MISSISSIPPI.

COLLEGE OF SCIENCE AND TECHNOLOGY

118 College Drive #5165 | Hattiesburg, MS 39406-0001
Phone: 601.266.4883 | Fax: 601.266.5829 | www.usm.edu

March 6, 2014

Ms. Gail Gettis, Director
Office of Teacher and Administrator Preparation
Mississippi Department of Education
P.O. Box 771
Jackson, MS 39205-0771

Dear Ms. Gettis:

Enclosed is our request for approval to offer a Secondary Mathematics Supplemental
Endorsement at The University of Southern Mississippi and the documentation to support our
request.

Please do not hesitate to contact us if you need any additional information for your review.
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Sincerely,

Dr. Patricia M. Biesiot
Interim Dean, College of Science and Technology

patricia.biesiot@usm.edu

UNIVERSITY OF SOUTHERN MISSISSIPPI

Secondary Mathematics Supplemental Endorsement

PROGRAM REQUIREMENTS

21-hour program of study requires the following:

- **Calculus (Choose 6 credit hours from the following):**
  - **MAT 167 - Calculus I with Analytic Geometry**
  - **MAT 168 - Calculus II with Analytic Geometry**
  - **MAT 169 - Calculus III with Analytic Geometry**
- **Advanced Level Algebra**
  - **MAT 326 - Introduction to Linear Algebra**
- **Statistics**
  - **MAT 115 - Elementary Statistics**
- **Geometry**
  - **MAT 370 - Introductory Geometry**
- **Trigonometry**
  - **MAT 103 – Plane Trigonometry**
- **Discrete Mathematics**
  - **MAT 340 – Discrete Mathematics**

NOTE: All current University of Southern Mississippi transfer equivalency agreements will be honored as they relate to this program of study.

COURSE DESCRIPTIONS

MAT 103 Plane Trigonometry. 3 hrs.
Prerequisites: ACT math-subscore ≥ 24 or a grade of C or better in MAT 101 College Algebra. Trigonometric functions and their inverses, trigonometric identities and equations, and solutions of triangles

MAT 115 Elementary Statistics. 3 hrs.
Prerequisites: ACT math-subscore ≥ 24 or a grade of C or better in MAT 101 College Algebra. Different types of statistics and data, measures of central tendency and variation, basic probability, confidence intervals, hypothesis testing and interpreting the results of a hypothesis test in the proper context, experimental design and regression analysis

MAT 167 Calculus I with Analytic Geometry. 3 hrs.
Prerequisites: ACT math-subscore ≥ 26 or a grade of C or better in MAT 103 College Algebra or MAT 128 Precalculus.
Limits, derivatives, applications of the derivatives

MAT 168 Calculus II with Analytic Geometry. 3 hrs.
Prerequisites: MAT 167
Integration, applications of integration, integration techniques

MAT 169 Calculus III with Analytic Geometry. 3 hrs.
Prerequisites: MAT 168
Sequences and infinite series, power series, parametric and polar curves, vectors and vector-valued funtions

MAT 326 Introduction to Linear Algebra. 3 hrs.
Prerequisites: None
Vector spaces, matrices, linear transformations, systems of linear equations, eigenvalues and

eigenvectors

MAT 340 Discrete Mathematics. 3 hrs.
Prerequisites: None
Logic, set theory and selected topics from algebra, combinatorics and graph theory

MAT 370 Introductory Geometry. 3 hrs.
Prerequisites: MAT 326, MAT 340
Concepts and principles of Euclidean and non-Euclidean geometries in two and three dimensions, axiomatics and proof, coordinate geometry and vectors, congruence and similarity, transformations, concepts and formulas related to two and three-dimensional space. Reasoning and proof, communication, problem-solving, connections, representations, and interactive geometry software are integrated throughout the course (Open only to those students preparing to teach mathematics in grades 7-12.)

EVIDENCE OF QUALIFIED FACULTY

The Department of Mathematics at the University of Southern Mississippi employs qualified full-time faculty and adjunct faculty to teach the mathematics courses outlined above. Some of these faculty members may include:

John Harris, Ph.D., Associate Professor, Ph.D. Mathematics, Louisiana State University, 2003

> Dr. Harris is a full-time faculty member in the Department of Mathematics. He teaches undergraduate and graduate level mathematics courses including MAT 167, MAT 168, MAT 169, MAT 326, and MAT 340.

Karen Kohl, Ph.D., Assistant Professor, Ph.D. Mathematics, Tulane University, 2011

> Dr. Kohl a full-time faculty member in the Department of Mathematics. She teaches undergraduate and graduate level mathematics courses including MAT 167, MAT 168, MAT 169, MAT 326, and MAT 340.

Sungwook Lee, Ph.D., Associate Professor, Ph.D. Mathematics, University of Connecticut, 2002

> Dr. Lee is a full-time faculty member in the Department of Mathematics. He teaches undergraduate and graduate level mathematics courses including MAT 167, MAT 168, MAT 169, MAT 326, and MAT 340.

Samuel J. Lyle, Ph.D., Assistant Professor, Ph.D. Mathematics, Clemson University, 2008

> Dr. Lyle is a full-time faculty member in the Department of Mathematics. He teaches undergraduate and graduate level mathematics courses including MAT 167, MAT 168, MAT 169, MAT 326, and MAT 340.

Rejoice Mudzimiri, Ph.D., Assistant Professor, Ph.D. Mathematics Education, Montana State University, 2012

> Dr. Mudzimiri is a full-time faculty member in the Department of Mathematics. She teaches undergraduate level mathematics education courses including MAT 370. She also teaches graduate level education courses for the Center for Mathematics and Science Education at the University of Southern Mississippi.

Susan C. Ross, Ph.D., Assistant Professor, Ph.D. Mathematics Education, University of Georgia, 1994

> Dr. Susan Ross is a full-time faculty member in the Department of Mathematics. She teaches undergraduate level mathematics education courses including MAT 370.

RATIONALE FOR COURSE SELECTION

The courses outlined above were chosen in order to provide teachers the mathematical content needed to be effective teachers. The chosen courses are in line with recommendations from the Mississippi Association of Mathematics Teacher Educators (MAMTE), the National council for Teachers of Mathematics NCATE Standards, and the Conference Board of the Mathematical Sciences (CBMS). The recommendations from these organizations are included for your reference.

MAMTE Recommendation for Secondary Mathematics Supplemental Endorsement Program

**Recommended Supplemental Endorsement Program for Secondary Mathematics
MAMTE Symposium, May 2012
Revised by MDE Licensure Sub-Committee, July 2012**

Hours	Course type	NOTES
6	Calculus	Minimum number of hours MAMTE strongly suggests to universities/colleges that this DOES NOT include pre-calculus course
3	Geometry	
3	Statistics	
3	An Advanced Algebra Course (linear, abstract, etc.)	
6	ELECTIVES (300+ level; Calculus III; Calculus IV; Elementary Functions/Pre-Cal; or Secondary Mathematics Methods Course)	Suggestion: MAMTE strongly suggests Foundations of Math type course or Methods course

NCTM NCATE Mathematics Content for Secondary
http://www.nctm.org/standards/content.aspx?id=2978

(See attached)

Southern States 6-12 Subject Area Add-on Endorsement Process

Mississippi (former policy)
http://www.mde.k12.ms.us/ed_licensure/supplemental.html

- Passing content area Praxis score, OR;

- 21 credit hours in the content area

Louisiana
https://www.teachlouisiana.net/Teachers.aspx?PageID=650

- Passing content area Praxis score, OR;

- 30 credit hours in the content area

Arkansas
http://arkansased.org/educators/licensure/adding_licensure.html

- Passing content area Praxis score, AND;

- University program of study
  (Univ. or AR -
  http://coehp.uark.edu/MathematicsALP.pdf)

  o 21 hours in math including:

    ▪ college algebra

    ▪ calculus

    ▪ geometry

    ▪ 2 math electives (any level)

    ▪ 2 math electives (3000-4000 level)

South Carolina
http://ed.sc.gov/agency/se/Educator-Certification-Recruitment-and-Preparation/Certification/documents/TeacherCertificationManual.pdf

- Passing content area examination score, AND;

- 26 hours in math outlined by state department including:

o 6 hours of algebra (abstract, matrix, and linear)

o 3 hours of geometry

o 8 hours of calculus

o 9 hours of math electives (probability, statistics, applied math, discrete math, number theory, analysis, advanced algebra, advanced geometry)

Tennessee

- Passing content area Praxis score AND completion of a university program (TN Tech Univ -

  http://www.tntech.edu/files/teachered/math_add.pdf)

  - o 22 hours in math including:

    - calculus

    - matrix algebra

    - concepts of math

    - geometry

    - statistical methods

    - history of math

- OR Passing Praxis content area examination score (only for those teachers that currently hold a 7-12 license in another area)

Florida

- BS or higher with a major in mathematics, OR;

- BS or higher with 30 hours in mathematics including, OR;

  - o 6 hours of calculus

  - o Geometry

  - o Probability or statistics

  - o Abstract or linear algebra

- BS or higher with specialization in physics AND 21 hours of mathematics including the above listed courses

Chapter 6 Appendix: Sample Undergraduate Mathematics Sequences

Short sequence (33 semester-hours).

I Courses taken by undergraduates in a variety of majors (15+ semester-hours)
- Single- and Multi-variable Calculus (9+ semester-hours)
- Introduction to Linear Algebra (3 semester-hours)
- Introduction to Statistics (3 semester-hours)

II Courses intended for all mathematics majors (9 semester-hours)
- Introduction to Proofs (3 semester-hours)
- Abstract Algebra (approach emphasizing rings and polynomials) (3 semester-hours)
- A third course for all mathematics majors (e.g., Differential Equations) (3 semester-hours)

III Courses designed primarily for prospective teachers (9 semester-hours).

Long sequence (42 semester-hours).

I Courses taken by undergraduates in a variety of majors (21 semester-hours)
- Single- and Multi-variable Calculus (9+ semester-hours)
- Introduction to Linear Algebra (3 semester-hours)
- Introduction to Computer Programming (3 semester-hours)
- Introduction to Statistics I, II (6 semester-hours)

II Courses intended for all mathematics majors (12 semester-hours)
- Introduction to Proofs (3 semester-hours)
- Advanced Calculus (3 semester-hours)
- Abstract Algebra (approach emphasizing rings and polynomials) (3 semester-hours)
- Geometry or Mathematical Modeling (3 semester-hours)

III Courses designed primarily for prospective teachers (9 semester-hours).

NCTM NCATE Mathematics Content for Secondary
Addendum to the NCTM NCATE Standards 2012

A. Secondary Mathematics Teachers

All secondary mathematics teachers should be prepared with depth and breadth in the following mathematical domains: Number, Algebra, Geometry, Trigonometry, Statistics, Probability, Calculus, and Discrete Mathematics. All teachers certified in secondary mathematics should know, understand, teach, and be able to communicate their mathematical knowledge with the breadth of understanding reflecting the following competencies for each of these domains.

A.1. Number and Quantity

To be prepared to develop student mathematical proficiency, all secondary mathematics teachers should know the following topics related to number and quantity with their content understanding and mathematical practices supported by appropriate technology and concrete models:

A.1.1 Structure, properties, relationships, operations, and representations including standard and non-standard algorithms, of various types of numbers and number systems including integer, rational, irrational, real, and complex numbers

A.1.2 Fundamental ideas of number theory (divisors, factors and factorization, primes, composite numbers, greatest common factor, least common multiple, and modular arithmetic)

A.1.3 Quantitative reasoning and relationships that include ratio, rate, and proportion and the use of units in problem situations

A.1.4 Vector and matrix operations, modeling, and applications

A.1.5 Historical development and perspectives of number, number systems, and quantity including contributions of significant figures and diverse cultures

A.2. Algebra

To be prepared to develop student mathematical proficiency, all secondary mathematics teachers should know the following topics related to algebra with their content understanding and mathematical practices supported by appropriate technology and concrete models:

A.2.1 Algebraic notation, symbols, expressions, equations, inequalities, and proportional relationships, and their use in describing, interpreting, modeling, generalizing, and justifying relationships and operations

A.2.2 Function classes including polynomial, exponential and logarithmic, absolute value, rational, trigonometric, and discrete and how the choices of parameters determine particular cases and model specific situations

A.2.3 Functional representations (tables, graphs, equations, descriptions, recursive definitions, and finite differences) and notations as a means to describe, interpret, and analyze relationships and to build new functions

A.2.4 Patterns of change in linear, quadratic, polynomial, and exponential functions and in proportional and inversely proportional relationships and types of real-world relationships these functions can model

A.2.5 Linear algebra including vectors, matrices, and transformations

A.2.6 Abstract algebra, including groups, rings, and fields, and the relationship between these structures and formal structures for number systems and numerical and symbolic calculations

A.2.7 Historical development and perspectives of algebra including contributions of significant figures and diverse cultures

A.3. Geometry and Trigonometry

To be prepared to develop student mathematical proficiency, all secondary mathematics teachers should know the following topics related to geometry and trigonometry with their content understanding and mathematical practices supported by appropriate technology and concrete models:

A.3.1 Core concepts and principles of Euclidean and non-Euclidean geometries in two and three dimensions

A.3.2 Transformations including dilations, translations, rotations, reflections, glide reflections; compositions of transformations; and the expression of symmetry in terms of transformations

A.3.3 Congruence, similarity and scaling, and their development and expression in terms of transformations

A.3.4 Right triangles and trigonometry

A.3.5 Application of periodic phenomena and trigonometric identities

A.3.6 Identification, classification into categories, visualization, and representation of two- and three-dimensional objects (triangles, quadrilaterals, regular polygons, prisms, pyramids, cones, cylinders, and spheres)

A.3.7 Formula rationale and derivation (perimeter, area, surface area, and volume) of two- and three-dimensional objects (triangles, quadrilaterals, regular polygons, rectangular prisms, pyramids, cones, cylinders, and spheres), with attention to units, unit comparison, and the iteration, additivity, and invariance related to measurements

A.3.8   Geometric constructions, axiomatic reasoning, and proof

A.3.9   Analytic and coordinate geometry including algebraic proofs (e.g., the Pythagorean Theorem and its converse) and equations of lines and planes, and expressing geometric properties of conic sections with equations

A.3.10 Historical development and perspectives of geometry and trigonometry including contributions of significant figures and diverse cultures

A.4. Statistics and Probability
To be prepared to develop student mathematical proficiency, all secondary mathematics teachers should know the following topics related to statistics and probability with their content understanding and mathematical practices supported by appropriate technology and concrete models:

A.4.1   Statistical variability and its sources and the role of randomness in statistical inference

A.4.2   Creation and implementation of surveys and investigations using sampling methods and statistical designs, statistical inference (estimation of population parameters and hypotheses testing), justification of conclusions, and generalization of results

A.4.3   Construction and interpretation of graphical displays of univariate data distributions (e.g., box plots, histograms, and cumulative frequency plots); summary measures and comparison of distributions of univariate data; and exploration of bivariate and categorical data

A.4.4   Empirical and theoretical probability (discrete, continuous, and conditional) for both simple and compound events

A.4.5   Random (chance) phenomena, simulations, and probability distributions and their application as models of real phenomena and to decision making

A.4.6   Historical development and perspectives of statistics and probability including contributions of significant figures and diverse cultures

A.5. Calculus
To be prepared to develop student mathematical proficiency, all secondary mathematics teachers should know the following topics related to calculus with their content understanding and mathematical practices supported by appropriate technology and concrete models:

A.5.1   Limits, continuity, rates of change, the Fundamental Theorem of Calculus, and the meanings and techniques of differentiation and integration

A.5.2   Parametric, polar, and vector functions

A.5.3   Sequences and series

A.5.4   Multivariate functions

A.5.5   Applications of function, geometry, and trigonometry concepts to solve problems involving calculus

A.5.6   Historical development and perspectives of calculus including contributions of significant figures and diverse cultures

A.6. Discrete Mathematics

To be prepared to develop student mathematical proficiency, all secondary mathematics teachers should know the following topics related to discrete mathematics with their content understanding and mathematical practices supported by appropriate technology and concrete models:

A.6.1   Discrete structures including sets, relations, functions, graphs, trees, and networks

A.6.2   Enumeration including permutations, combinations, iteration, recursion, and finite differences

A.6.3   Propositional and predicate logic

A.6.4   Applications of discrete structures such as modeling and solving linear programming problems and designing data structures

A.6.5   Historical development and perspectives of discrete mathematics including contributions of significant figures and diverse cultures