California State University, San Marcos General Education Program
GENERAL EDUCATION NEW COURSE CERTIFICATION REQUEST
• AREA B4: Mathematics and Quantitative Reasoning
See GE Handbook for information on each section of this form

ABSTRACT

Course Abbreviation and Number: MATH 212 **Number of Units: 3**	**Course Title: Mathematics for K-8 Teachers II: Geometry, Measurement, and Reasoning**	
College or Program: ☐CHABSS ☒CSM ☐CEHHS ☐COBA ☐Other	**Desired term of implementation:** ☒Fall ☐Spring ☐Summer Year2014	**Mode of Delivery:** ☒face to face ☐hybrid ☐ fully on-line
Course Proposer (please print): David Barsky	**Email: djbarsky@csusm.edu**	**Submission Date:**

1. Course Catalog Description: Designed to reinforce mathematical concepts for those teaching in grades K-8. Emphasis on patterns and functional relationships; geometric concepts in two- and three-dimensional space: points, lines, planes, curves, triangles, convex figures, parallelism, congruence, similarity, symmetry, perimeter, area, and volume; problem-solving strategies; appropriate use of technology; and historical/cultural perspectives. *Credit may not be counted toward the mathematics major. Enrollment restricted to students who have completed the Entry-Level Mathematics (ELM) requirement. Prerequisite: MATH 210 with a grade of C (2.0) or better.*

2. GE Syllabus Checklist: The syllabi for all courses certified for GE credit must contain the following:

☒	Course description, course title and course number
☒	Student learning outcomes for General Education Area and student learning objectives specific to your course, linked to how students will meet these objectives through course activities/experiences
☒	Topics or subjects covered in the course
☒	Registration conditions
☒	Specifics relating to how assignments meet the writing requirement
☒	Tentative course schedule including readings
☒	Grading components including relative weight of assignments

SIGNATURES

David Barsky 4/23/14
Course Proposer Date

Andre Kundgen 4/23/14
Department Chair date

Please note that the department will be required to report assessment data to the GEC annually. _____ *DC Initial*

	Support	Do not support*
Library Faculty 4/23/14 Date	☒	☐
Impacted Discipline Chair (Liberal Studies) 4/23/14 Date	☒	☐
Impacted Discipline Chair Date	☐	☐

	Approve	Do not Approve
GEC Chair Date	☐	☐

*** If the proposal is not supported, a memo describing the nature of the objection must be provided.**

Course Coordinator: Varies each year. Contact the Department Chair for a name. Phone Email:

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Part A: B4 Quantitative Reasoning General Education Learning Outcomes (GELOs) related to course content. [Please type responses into the tables.]

Math/Quant Reasoning GELOs this course will address:	Course content that addresses each GELO.	How will these GELOs be assessed?
B4.1: Explain and apply a variety of fundamental mathematical concepts, symbols, computations and principles.	Concepts: Measurement; metric system; perimeter, area, volume, and surface area; congruence and similarity; Euclidean constructions; coordinate systems; distance; rigid motions (translation, refection and rotation); symmetry, slope Symbols: Notation for lines, line segments, angles, angle measures, right angles, arcs, equality, congruence, perpendicular, parallel, triangle Computations: Solving proportion relations, applications of the Pythagorean theorem Principles: Dimensional analysis, proofs in an axiomatic system, relationship between symbolic expressions (algebra) and graphs of lines and circles (geometry)	Students will be given problems involving one or more of the concepts learned and be expected to solve it using the relevant symbols and computations and principles. Students will be expected to state their solution in a clear and logical manner. Examples: • Students will be able to answer a real-world questions by translating the (simple) real-world situation into a linear relationship, solving a liner equation, and interpreting the solution in terms of the graph of the linear equation. • Students will use geometric similarity arguments to set up a proportion relation that can be solved to provide an indirect measurement (e.g., height of a building, width of a river, etc.). • Students will use the Pythagorean theorem to calculate distances in a variety of settings. A major focus of this course is on understanding what a proof is and how it can be motivated by, but is quite different from, a collection of specific examples.
B4.2: Determine which quantitative or symbolic reasoning methods are appropriate for solving a given problem and correctly implement those methods.	An example: Determining the measure of an angle in a geometric figure from the given information.	Students will need to analyze the figure to determine what combination of congruence techniques (vertical angles, special pairs of angle when a transversal cuts a pair of pair of parallel lines, corresponding angles in similar figures), supplementarity, complementarity, and/or the sum of the measures of interior angles in a polygon is needed to determine the desired angle measure.

Part B: General Education Learning Outcomes required of all GE courses related to course content:

GE Outcomes required of <u>all</u> Courses	Course content that addresses each GE outcome?	How will these GELOs be assessed?
Students will communicate effectively in writing to various audiences. (writing)	Homework and exam problems will require students to explain their reasoning. The syllabus asks students to include detailed explanations of	Attainment of this GELO could be assessed by applying a writing rubric to sampled student homework.

	solutions in the homework.	
Students will think critically and analytically about an issue, idea or problem. (critical thinking)	As a course intended for Pre-k-8 teachers, this course not only addresses NCTM (National Council of Teachers of Mathematics) content standards, but also process standards, which include • problem solving (applying mathematical knowledge in unfamiliar situations), e.g., developing Euler's formula relating the number of edges, faces and vertices for simple solids; • using reasoning and proof as a way of thinking about, justifying and making sense of mathematics, e.g., using congruence axioms to determine when triangles are congruent; and • making connections between different mathematical ideas, e.g., using the Pythagorean theorem to calculate the area of a rectangle given the aspect ratio and the diameter.	Attainment of this GELO could be assessed by sampling student homework and exams.

Part C: GE Programmatic Goals: The GE program aligns with CSUSM specific and LEAP Goals. All B4 courses must meet at least one of the LEAP Goals.

GE Programmatic Goals	***Course addresses this LEAP Goal:***
LEAP 1: Knowledge of Human Cultures and the Physical and Natural World.	☐ *No* ☒ *Yes*
LEAP 2: Intellectual and Practical Skills	☐ *No* ☒ *Yes*
LEAP 3: Personal and Social Responsibility	☒ *No* ☐ *Yes*
LEAP 4: Integrative Learning	☒ *No* ☐ *Yes*
CSUSM Specific Programmatic Goals	**Course content that addresses the following CSUSM goals. Please explain, *if applicable.***
CSUSM 1: Exposure to and critical thinking about issues of diversity.	☒ *No* ☐ *Yes (please describe):*
CSUSM 2: Exposure to and critical thinking about the interrelatedness of peoples in local, national, and global contexts.	☒ *No* ☐ *Yes (please describe):*

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Part D: Course requirements to be met by the instructor.

Course Requirements:	How will this requirement be met by the instructor?
Course meets the All-University Writing requirement: A minimum of 2500 words of writing shall be required for 3+ unit courses.	The writing requirement will be met through students being required to include detailed explanations of their solutions in the homework.
All courses offered in area B4 must have a prerequisite of at least intermediate algebra and must use a level of mathematics beyond that of intermediate algebra. No remedial algebra courses (e.g., Math 10, 20, and 30) can be used to satisfy this requirement. Even if a course has intermediate algebra as a prerequisite, it will not satisfy the Quantitative Reasoning Requirement unless it also meets each of the following three conditions:	Students explore relationships between symbolic expressions and graphs of lines, paying particular attention to the meaning of slope and intercept (e.g., understanding how the slope of lines is connected to possible intersections and/or orthogonality, and finding the equation of the perpendicular bisector of a line segment). In constructing "coordinate proofs," students use algebra (including the distance formula) to prove various properties of polygons. Additionally, MATH 212 has an explicit prerequisite of (a C or higher in) MATH 210, which in turn has the following enrollment condition: Enrollment restricted to students who have completed the Entry-Level Mathematics (ELM) requirement. (The ELM requirement is that students demonstrate proficiency at the level of intermediate algebra.) Additional content matter building upon intermediate algebra can be found in MATH 210 in the treatment of algebraic topics such as non-linear functions, systems of linear equations and the use of algebra tiles to solve integer equations.
• It must focus on the use of mathematical language and formal reasoning in a variety of diverse disciplines, using a broad range of examples.	By the end of the course, students will know, and will have used, over 150 mathematical terms pertaining to geometry: AA similarity axiom, AAS congruence axiom, ASA congruence axiom, angle of symmetry, axiom, …, tessellation, tile, translation vector, transversal, trapezoid, triangle. Examples of disciplines to which applications are made include: • Trade and Science: Measurement systems • Measurement: Calculating distances by counting rotations of a wheel; Finding volumes of irregular objects by immersion in regular containers; Using similar triangles to calculate the height of an object • Business/Economics: Solving problems involving fixed and marginal costs modeled by a linear function • Art: Creation of Escher-like tesselations
• It must provide some historical perspective on the role which this approach has played in the development of human knowledge and of our understanding of the world.	Historical notes that students encounter include • Development of conventions for labeling (the use of letters as labels for points, lines and planes occurs goes back to the Greeks and was used in 440 BCE by Hippocrates) and mathematicians often use the first letter of a key word to describe quantities (and examples of how this has changed in different contexts from Latin to German to

	English) • Regular polyhedral or Platonic solids and how Plato associated these with nature • The metric system, its relation to the decimal system and how confusion between the metric system and the U.S. customary system of lengths and forces led to the crash of the Mars Climate Observer satellite. • Introduction of the now-common assumptions made by Cavalieri in the 17th century that a line consisted of infinitely many points, and a plane consisted of infinitely many lines • Origin of various mathematical notations, e.g., Oughtred introduced || for parallel lines in 1657.
• It must demonstrate a variety of methods, such as the use of abstract symbols, of numeric techniques, of logical reasoning, of geometry, etc.	See the response to B4.1.
A **statistics component** may be included which must:	
• Develop the students' ability to comprehend the power and broad utility of the fundamental mathematical models presented, rather than merely teaching rote statistical skills; and	N/A for MATH 212
• Must indicate applications to several areas.	N/A for MATH 212
A **computer science component** may be included which must:	
• Teach a computer language that is suitable for use in diverse areas;	N/A for MATH 212
• Teach this language in such a way that the student is led to a fundamental understanding of the nature of problem solving by combining data structures with algorithms; and	N/A for MATH 212
• Provide fundamental skills in the use of computers for the application of university level quantitative methods to the solution of problems in many diverse areas.	N/A for MATH 212

Math 212
Mathematics for Elementary School Teachers
CSU San Marcos
Spring 201__

Instructor: _____

Contact: Email: _____@csusm.edu **Website:** http://cc.csusm.edu

Office Hours: _____; Room: _____

Textbook: Mathematics for Elementary School Teachers; Ricardo Fierro

Prerequisites: Math 210 with a grade of C or better

Course Description: This course is an exploration of mathematical concepts and content commonly taught in grades K-8: geometric concepts in two- ad three-dimensional space: points, lines, planes, curves, triangles, convex figures, parallelism, congruence, similarity, symmetry, perimeter, area, volume; problem-solving strategies.

General Education Learning Outcomes: Successful completion of this course satisfies the General Education requirement in Mathematics/Quantitative Reasoning (B4). Students who successfully complete this course will be able to

- Explain and apply a variety of fundamental mathematical concepts, symbols, computations and principles; and
- Determine which quantitative or symbolic reasoning methods are appropriate for solving a given problem and correctly implement those methods.

Materials: You are required to have and bring to class every day a pencil or pen and paper for taking notes, compass, protractor, ruler and your textbook. You will need a calculator for exams and scantron forms 882-E for quizzes. Please note that I do not have extra calculators. Having a calculator the day of the exam is your responsibility. You will not be allowed to use calculators on cell phones or any electric device that has internet or text-messaging capabilities. You will not be allowed to share calculators on the day of the exam.

Homework: There will be 12 homework assignments over the course of the semester (one from each section we will cover). No late homework will be accepted for any reason whatsoever. Each homework will be worth 10 points and your two lowest grades will be dropped. Homework should include detailed explanations of your solutions. Note that this will also meet the 2500 word writing requirement.

Homework is very important. Math is not a spectator sport: *You can listen and read all you like, but you don't really learn much until you grab a pencil and do some problems.*

Exams: There will be three regular exams and a comprehensive final. Exam dates are listed in the class schedule. Absolutely no makeup exams will be given for any reason whatsoever. Don't even ask. I will, however, replace your lowest exam score with the same score you receive on the final if it is higher. *Please note the time of the final exam is listed in the course schedule.

Quizzes: There will be a multiple choice, scantron quiz at the end of each section; some, or all, of which may be take home quizzes. If a quiz is take home, it is expected that you work on it individually. The

quizzes will be posted in the math lab with "no tutor help allowed" notices. Each quiz will be worth 10 points and will be due the class period after they are handed out. Your lowest two quiz scores will be dropped.

Attendance: Each class will incorporate group and self-study opportunities. You are expected to participate in these opportunities in order to reinforce fundamental mathematical concepts, to learn from others, to increase your willingness to try new problems and to improve success in solving problems. For this reason, attendance is mandatory.

Grading: Your grade will be computed according to the following:

Homework:	5%
Quizzes:	10%
Exams:	60%
Final Exam:	25%

Your final grade will be determined according to the following:

A	90% and above
B	80%-89%
C	70%-79%
D	60%-69%
F	Below 60%

Accommodations: Students with disabilities who require reasonable accommodations must be approved for services by providing appropriate and recent documentation to the Office of Disabled Student Services (DSS). This office is located in Craven Hall 4300, and can be contacted by phone at (760) 750- 4905, or TTY (760) 750-4909. Students authorized by DSS to receive reasonable accommodations should meet with me after class or during my office hours in order to ensure confidentiality.

Academic Integrity: The short story: DON'T CHEAT! The long story: All written work must be original work. Students are responsible for honest completion of their work including examinations. There will be no tolerance for infractions. If you believe there has been an infraction by someone in the class, please bring it to the instructor's attention. The instructor reserves the right to discipline any student for academic dishonesty, in accordance with the general rules and regulations of the university. Disciplinary action may include the lowering of grades and/or the assignment of a failing grade for an exam, assignment, or the class as a whole. Incidents of Academic Dishonesty will be reported to the Dean of Students. Sanctions at the University level may include suspension or expulsion from the University

Expectations: First, I expect you to attend class regularly. It is a rare student who does well in a class without being there.

Mathematics can be a very demanding subject. You should expect to spend 3-4 hours studying and completing homework assignments for each hour spent in class.

You will get a lot more out of class if you read the material we are going to be covering beforehand. I realize that reading a math book isn't always the easiest thing to do, but give it a try!

It is vital that you keep up, as every topic we cover builds on previous topics. If you feel yourself falling behind, seek help IMMEDIATELY! The Math Lab in Kellogg 1109 has excellent tutors. I highly recommend them. Study groups are also a good idea. You'll be surprised how simply talking through a problem helps with understanding.

Schedule:

Class Session:	*Section in Text:*	*Topics:*
1	10.1	1. Building blocks of geometry: Terminology and notation 2. Point and line relationships 3. Distance, line segments, congruence and rays.
2	10.1	1. Postulates 2. Midpoint 3. Angles: Terminology and notation
3	10.2	1. Pairs of angles 2. F-postulate
4	10.2	1. Polygons 2. Regular Polygons
5	10.3	1. Polyhedrons
6	10.3	1. Prisms 2. Pyramids 3. Platonic solids.
7	Review	
8	Exam 1	
9	11.1	1. Concept of measurement and measurement systems 2. Process of measurement. 3. Precision vs. accuracy
10	11.1	1. US customary system of measurement. 2. Metric system 3. Dimensional analysis
11	11.2	1. Perimeter 2. Definition of π and circumference 3. Arc length
12	11.2	1. Area of polygons 2. Area of a circle
13	11.3	1. The Pythagorean Theorem 2. Pythagorean inequalities 3. Triangle inequalities
14	11.3	1. Area of regular polygons
15	11.4	1. Volume 2. More dimensional analysis
16	11.4	1. Surface area
17	Review	
18	Exam 2	
19	12.1	1. Triangle Axioms 2. Congruence Axioms
20	12.1	1. Applying congruence axioms 2. 2-column and paragraph proofs.
21	12.3	1. Similarity Axioms

22	12.3 12.2	1. Applying similarity axioms 2. Similar triangles and polygons 1. Euclidean constructions
23	13.1	1. Coordinate system 2. Vertical, horizontal and oblique lines 3. Slope of a line
24	13.1	1. Equation of a line 2. Parallel lines 3. Perpendicular line
25	Review	
26	Exam 3	
27	13.2	1. Distance formula 2. Midpoint formula 3. Equation of a circle
28	13.3	1. Transformations of the plane 2. Tessellations
29	Review	
30 (Finals Week)	Final Exam	