MATH 0019 - MATHEMATICAL CONCEPTS FOR ELEMENTARY SCHOOL TEACHERS

SECTION A

1. Division:	Sciences & Mathematics
2. Subject Code:	MATH
3. Course Number:	0019
4. Course Title:	MATHEMATICAL CONCEPTS FOR ELEMENTARY SCHOOL TEACHERS
5. Semester of First Offering:	FALL 2016

SECTION B	General Course Information

1.Units: 3.0   **Variable Units:** N/A

2.This Course is: Degree-Applicable Credit - Transferable

3A. Cross-List: **3B. Formerly:**

Course Format and Duration

4. Standard Term Hours per Week		5. Standard Term Total Semester Hours	
Lecture/Discussion:	3	Lecture/Discussion:	54
Lab:		Lab:	
Activity:		Activity:	
By Arrangement:		By Arrangement:	
Total Hours per Week:	3	**Total Hours :**	54

6. Minimum hours per week of independent work done outside the class: 6

Course Preparation - (Supplemental form B required)

7a. Prerequisite(s): (Course and/or other preparation/experience that is <u>REQUIRED</u> to be completed previous to enrollment in this course.)

     Completion of two years of high school algebra or MATH 0000D with grade(s) of "C" or better, or placement by matriculation assessment process

7b. Co-requisite(s): (Courses and/or other preparation that is REQUIRED to be taken concurrently with this course.)

7c. Advisory: (MINIMUM preparation RECOMMENDED in order to be succesful in this course. Also known as "Course Advisory".)

Catalog Description And Other Catalog Information:

8. Repeatability: **Not Repeatable**

Please note: Repeatability does <u>not</u> refer to repeating courses because of substandard grades or a lapse of time since the student took the course. A course may be repeated <u>only </u>if the course content differs each time it is offered and the student who repeats it is gaining an expanded educational experience as stipulated in Title V.

- ☐ Skills or proficiencies are enhanced by supervised repetition and practice within class periods.
- ☐ Active participatory experience in individual study or group assignments is the basic means by which learning objectives are attained.
- ☐ Course content differs each time it is offered.

Explanation for above repeatability selection:

9a. Grading Option: Standard Grade

9b. Catalog Description:

This course focuses on the development of quantitative reasoning skills through in-depth, integrated explorations of topics in mathematics, including the real number system and its subsystems. The emphasis is on comprehension and analysis of mathematical concepts and applications of logical systems.

Course Outline Information

10. Student Performance Objectives: (Performance objectives for all credit courses must indicate that students will learn critical thinking and will be able to apply concepts at college level.Performance objectives must be related to items listed in Section 11.)

1. Perform calculations with place value systems;
2. Evaluate the equivalence of numeric algorithms and explain the advantages and disadvantages of equivalent algorithms in different circumstances;
3. Apply algorithms from number theory to determine divisibility in a variety of settings;
4. Analyze least common multiples and greatest common divisors and their role in standard algorithms;
5. Explain the concept of rational numbers, using both ratio and decimal representations; analyze the arithmetic algorithms for these two representations; and justify their equivalence;
6. Analyze the structure and properties of whole, rational, and real number systems; define the concept of rational and irrational numbers, including their decimal representation; and illustrate the use of a number line representation;
7. Develop and reinforce conceptual understanding of mathematical topics through the use of patterns, problem solving, communication, connections, modeling, reasoning, and representation; and
8. Develop activities implementing curriculum standards.

11. Course Content Outline: (Provides a comprehensive, sequential outline of the course content, including all major subject matter and the specific body of knowledge covered.)

1. Numeration systems: history, Hindu-Arabic numeration system, and place value systems;
2. Integers: structure and basic properties, computational algorithms;
3. Basic number theory: divisibility, prime and composite numbers, prime factorization, the Fundamental Theorem of Arithmetic, least common multiple and greatest common divisor;
4. Rational numbers: structure and properties, ratio and proportion;
5. Real numbers: structure and basic properties, arithmetic operations, the rational and irrational subsystems, decimal and real number line representations;
6. Patterns, problem solving, communication, connections, modeling, reasoning, and representation; and
7. National and state curriculum standards for elementary school math including Common Core State Standards.

12. Typical Out-of-Class Assignments: (Credit courses **require** two hours of independent work outside of class for each lecture hour, less lab/activity classes. List type of assignments including library assignments.)

a. Reading Assignments: (Submit at least 2 examples.)
1. Read the historical conflict that the ancient Greeks encountered with the irrational numbers and how this conflict shaped the direction of Greek mathematical thought towards geometry.
2. Investigate through reading the history of numeration systems, including the discovery or absence of the number zero in ancient cultures. This history will include Mayan, Chinese, Egyptian, Roman, Babylonian, and Hindu-Arabic numeration systems.

b. Writing, Problem Solving or Performance: (Submit at least 2 examples)

1. Verify that a given number in decimal form that has either a finite decimal expansion or an infinite decimal expansion is indeed a rational number (i.e., it can be expressed as the ratio of two integers).
2. Generate the greatest common divisor of two natural numbers in a variety of ways, including the Euclidean Algorithm and with the use of Venn diagrams.

c. Other (Term projects, research papers, porfolios, etc.)

13. Required Materials:

a. All textbooks, resources and other materials used in this course are college level?

☑   Yes
☐   No

b. Representative college-level textbooks (for degree applicable courses) or other print materials:

<u>Book 1:</u>

Author:	Tom Bassarear, Meg Ross
Title:	Mathematics for Elementary School Teachers
Publisher:	Cengage
Date of Publication:	2016
Edition:	6

c. Other materials and/or supplies required of students:

14. Check all Instructional methods used to present course content:

☑	Lecture	☐	Activity
☐	Discussion Semminar	☐	Distance Education (requires supplemental form)
☐	Lab	☐	Work Experience
☐	Directed Study	☐	Tutoring

Other:

Give detailed examples of teaching methodology that relate to the course performance objectives:

1. The instructor will provide the student with two natural numbers. Through long division or a factor tree, the student will find the prime factorization of these two natural numbers. The student will use two distinct colored circular transparent pieces of plastic, duplicating the image of a Venn diagram, and write on the appropriate parts of these plastic circle the prime factors of the given natural numbers so that the prime factors of the gcd is in the intersection and the prime factors of the lcm represent the union. In addition, the student will use the Euclidean algorithm to generate the gcd of the two given natural numbers and compare the result with the intersection of the two pieces of plastic. In addition, the student will algorithmically re-express the gcd as a linear combination of the two given natural numbers. The student will write their responses, including the algorithms, for the instructor to read and review. This addresses the course objectives 1 and 2.
2. The instructor will briefly partition the class into subgroups. Each group is to use fractions to identify their group. The groups will submit these descriptors to the instructor and the instructor will redistribute them to the groups. Each group will then identify which group their descriptors represents. Course objective 2 is addressed.

15. Methods of Assessing Student Learning
15a. Methods of Evaluation:

☑	Essay Exam	☐	Reports
☑	Objective Exam	☑	Problem Solving Exam
☐	Projects	☐	Skill Demonstration
☐	Class Discussion	☐	Other

15b. (All courses must provide for measurement of student performance in terms of stated student performance objectives, Area 10, and culminate in a formal recorded grade based on uniform standards. Submit at least 2 examples.)

1. Essay exam questions will assess student understanding of the history of a variety of topics. The instructor will grade these exams relative to their clarity, correctness, and organization. Two examples include the history of the zero element in ancient numeration systems, and the history of the discovery (and consequent problems) of irrational numbers in ancient Greek society.

2. Objective exam questions will assess student ability to perform algorithms developed in the course. The instructor will identify if the algorithm was used correctly and that the correct solution was obtained. The Euclidean algorithm is used to find the gcd of two natural numbers, and the Division algorithm is used to rewrite an improper rational number as a mixed numeral. Both these algorithms will be presented on an objective exam.

3. Problem solving exam questions will assess student ability to formulate a procedure and a solution to a given mathematical problem. The instructor will grade the response in terms of both its clarity and correctness. For example, a student will be given the distance of two individuals on the surface of this planet, one with the sun directly above. The other does not have the sun directly above, but knowing the angle that the sun makes with the second individual's shadow will allow the student to determine the circumference of the earth (this is an example of using fractions to solve a problem and is a replication of Eratosthenes findings). Another problem solving exam question will have the student use the Fibonacci sequence to build a new sequence. With this new sequence, the first entry is the ratio of the second Fibonacci number to the first. The second entry is the ratio of the third Fibonacci number to the second. Repeating this process, the student will be asked to determine the number to which the nth term of this sequence is approaching.

SECTION C

1. Program Information:

☑	In an approved program
☐	Part of a new program
☐	Not part of an approved program

2. TOP Code Information

Program Title: Mathematics, General 170100

3. Course SAM Code:

☐	A - Apprenticeship Course
☐	B - Advanced Occupational
☐	C - Clearly Occupational
☐	D - Possibly Occupational
☑	E - Non-Occupational

4. Faculty Minimum Qualifications/Degrees:

Mathematics

Comments:

SECTION D

General Education Information:

1. College Associate Degree GE Applicability:

Communication & Analytic Thinking
Mathematics Competency

2. CSU GE Applicability:

B-4 Mathematics/Quantitative Reasoning

3. IGETC Applicability:

4. CAN :   MATH 120 Mathematical Concepts for Elementary School Teachers - Number Systems

5. LDTP:

SECTION E

1. Articulation Information: (Required for Transferable Courses Only)

☑   CSU Transferable

☑   UC Transferable

☐   CSU/UC Major Requirement.

If CSU/UC major requirement, list campus and major. (Note: Must be lower division)

2. List at least one community college and its comparable course. If requesting CSU and/or UC transferability also list a CSU/UC campus and comparable lower division course

Berkeley City College: MATH 18 Real Number Systems, CSU and UC
transferable
Cabrillo College: MATH 15 Number Systems, CSU and UC transferable
Hartnell College: MAT 12 Number Systems, CSU and UC transferable
Napa Valley College: MATH 130 Mathematical Concepts for Elementary School
Teachers - Number Systems, CSU and UC transferable
San Francisco State University: MATH 165 Concepts of the Number System
San Jose State University: MATH 12 Number Systems

SECTION F

Planning and Resources: Please address the areas below:

1. Evidence of Need or Potential: recommendations of advisory committee, connection to existing or planned degrees/certificates, or regional/national developments, transfer university requirements.

This is a transfer course to the CSU system as well as a requirement of the ADT degree at Sierra College.

2. Appropriateness to Mission: connection to basic skills, transfer, career technical education, or lifelong learning; relationship

3. Place in Program/Department: relationship to student learning outcomes identified by program, connection to general education, or articulation with other institutions.

4. Availability of Faculty and Facilities: minimum qualifications to teach course, special training for instructors, or long-term physical impact of course.

There will probably be one section of this course offered each semester. Consequently, the facilities impact will be minimal. The department anticipates that this will effectively eliminate the offering of the single section of Math 17 each semester. If this happens, then the impact of offering a single section of Math 19 each semester on facilities will be zero.

5. Potential Impact on Resources: impact on library, computer support, transportation, equipment, or other needs

SECTION G

1. Maximum Class Size (recommended): 35

2. If recommended class size is not standard, then provide rationale: