SIERRA COLLEGE

MATH 0015 - DISCRETE MATHEMATICS

SECTION A

1. **Division:** Sciences & Mathematics
2. **Course Discipline:** MATH
3. **Course Number:** 0015
4. **Course Title:** DISCRETE MATHEMATICS
5. **First semester this new version/new course will be offered:** SPRING 2014

SECTION B General Course Information

1.Units: 4.0 **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

Lecture/Discussion:	4
Lab:	
Activity:	
By Arrangement:	
Total Hours per Week:	4

5. Standard Term Total Semester Hours

Lecture/Discussion:	72
Lab:	
Activity:	
By Arrangement:	
Total Hours :	72

6. Minimum hours per week of independent work done outside the class: 8

Course Preparation - (Supplemental form B required)

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

Completion of MATH 30 with grade of "C" or better

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 not refer to repeating courses because of substandard grades or a lapse of time since the student took the course. A course may be repeated only 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:

Study of set theory, relations and functions, logic, combinatorics and probability, algorithms, computability, matrix algebra, graph theory, recurrence relations, number theory including modular arithmetic. Various forms of mathematical proof are developed: proof by induction, proof by contradiction.

Course Outline Information

10. Course 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. create mathematical proofs directly, indirectly, and by contradiction;
2. use mathematical induction to create a mathematical proof;
3. create a mathematical proof with truth tables and logical equivalences;
4. translate mathematical statements using universal and existential quantifiers;
5. use sets to organize and quantify data;
6. create an algorithm using pseudocode;
7. evaluate a series;
8. model using permutations and combinations and numerically evaluate appropriate applied problems;
9. model using probabilities, including conditional probabilities;
10. solve counting problems using a generating function;
11. assess that a relation is an equivalence relation;
12. create a graph and a tree to describe the structure of a system;
13. use Boolean algebra to mathematically model electronic circuits;
14. verify functions are one-to-one and onto;
15. use matrices to solve applied problems.

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.)

I. Predicate Calculus
A. Propositional Equivalences
B. Universal and Existential Quantifiers
II. Proofs
A. Counterexample
B. Direct
C. Indirect
D. Contradiction
E. Mathematical Induction
F. Truth Tables
G. Logical Equivalences
III. Algorithms
A. Complexity
B. Growth
C. The Division Algorithm
D. The Euclidean Algorithm
E. Number Bases
IV. Counting Principles
A. Combinatorics
B. Generating Functions
C. Difference Equations
V. Probability
A. Conditional Probability
B. Independence
C. Expected Value
VI. Relations
A. Equivalence Relation
VII. Graphs and Trees
A. Euler and Hamiltonian Paths
B. Shortest Distance Applications
VIII. Boolean Algebra
A. Logic Gates and Switching Circuits
IX. Matrices
A. Operations
B. Applications
C. Systems of Equations

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. Throughout the course, read assigned topics from text. For example, how to verify the validity of a mathematical formula by mathematical induction.

2. Search the library or the internet for applications of the golden ratio and the Fibonacci sequence.

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

1. Write mathematical proofs. For example, given a function f, prove that the image of the intersection of two sets is a subset of the intersection of the images of those two sets.

2. Prove that the limit of the ratio of a Fibonacci number to its predecessor is the golden ratio.

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:

Book 1:

Author:	Kenneth Rosen
Title:	Discrete Mathematics and Its Applications
Publisher:	McGraw Hill
Date of Publication:	2012
Edition:	seventh

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

Methods of Instruction

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

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

Other:

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

1. create mathematical proofs directly, indirectly, and by contradiction:

The instructor will provide through a lecture format mathematical proofs of various types, including proof by contradiction. The instructor will then ask the student to construct a proof of this type. An example is: prove that sqr(2) is irrational. Typically, a student will provide his/her proof to the class and both students and instructor will evaluate the correctness, the level of rigor, and the clarity of presentation.

2. use mathematical induction to create a mathematical proof:

The instructor will provide through a lecture format mathematical proofs of various types, including mathematical induction. The instructor will then ask the student to construct a proof of this type. An example is: prove that the sum of the first n integers is n(n+1)/2. Typically, a student will provide his/her proof to the class and both students and instructor will evaluate the correctness, the level of rigor, and the clarity of presentation.

15. Methods of Assessing Student Learning

15a. Methods of Evaluation:

- ☐ Essay Exam
- ☑ Objective Exam
- ☑ Projects
- ☑ Class Discussion
- ☐ Reports
- ☑ Problem Solving Exam
- ☐ Skill Demonstration
- ☐ 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. Exams will determine a student's ability to independently construct a mathematical proof. For example, a student might be asked to write a formal proof that sqr(2) is irrational. The instructor will assess the success of the proof by determining if the appropriate proof format is used (i.e., proof by contradiction), that the guidelines of such a proof are being employed (i.e., the negation of the conclusion of the conditional statement in the theorem is stated), and that the remaining body of the proof meets college level rigor and clarity.

2. A classroom discussion will be employed upon the completion of a presentation from a student, particularly with an example of proof writing. The instructor will assess the rigor, clarity, and correctness of the proof. In addition, the instructor will assess the level of understanding of the student presenting such a proof through that student's answers to questions from other students and from the instructor.

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 Discipline Assignment(s):

Mathematics

Comments:

SECTION D

General Education Information:

1. College Associate Degree GE Applicability:

Communication & Analytic Thinking

Math Competency

2. CSU GE Applicability:

B-4 Mathematics/Quantitative Reasoning

3. IGETC Applicability:

2: Mathematical Concepts & Quantitative Reasoning

4. C-ID :

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

Laney College, Math 11, Discrete Mathematics
Humboldt State University, Math 253, Discrete Mathematics
San Diego State University, Math 245 Discrete Mathematics
University of California, Riverside, Math 11, Introduction to Discrete Structures

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.

recommendations of advisory committee, connection to existing or planned degrees or transfer university requirements.

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

connection to transfer or lifelong learning.

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

relationship to student learning outcomes identified by program, connection to general education, or articulation with other institutions. Meets all four student learning outcomes for the math program.

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

Minimum qualifications to teach the course.
No special qualifications or training to teach the course.

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

There is no 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: