MATH 4 Course Outline as of Summer 2017

CATALOG INFORMATION

Dept and Nbr: MATH 4 Title: DISCRETE MATHEMATICS
Full Title: Discrete Mathematics
Last Reviewed: 9/14/2020

Units		Course Hours per Week		Nbr of Weeks	Course Hours Total	
Maximum	4.00	Lecture Scheduled	4.00	17.5	Lecture Scheduled	70.00
Minimum	4.00	Lab Scheduled	0	6	Lab Scheduled	0
		Contact DHR	0		Contact DHR	0
		Contact Total	4.00		Contact Total	70.00
		Non-contact DHR	0		Non-contact DHR	0

Total Out of Class Hours: 140.00 Total Student Learning Hours: 210.00

Title 5 Category:	AA Degree Applicable
Grading:	Grade Only
Repeatability:	00 - Two Repeats if Grade was D, F, NC, or NP
Also Listed As:	
Formerly:	

Catalog Description:
A lower division discrete mathematics course including formal logic, Boolean logic and logic circuits, mathematical induction, introduction to number theory, set theory, principles of combinatorics, functions, relations, recursion, algorithm efficiency and graph theory.

Prerequisites/Corequisites:
Completion of MATH 27 or higher (VF) OR Course Completion of MATH 25 and Course Completion of MATH 58; or Qualifying Placement from Math Assessment.
See Student Success & Assessment Services (assessment.santarosa.edu) for more information about the assessment process.

Recommended Preparation:
Course Completion of MATH 1A

Limits on Enrollment:

Schedule of Classes Information:
Description: A lower division discrete mathematics course including formal logic, Boolean logic and logic circuits, mathematical induction, introduction to number theory, set theory, principles of combinatorics, functions, relations, recursion, algorithm efficiency and graph theory. (Grade

Only)
Prerequisites/Corequisites: Completion of MATH 27 or higher (VF) OR Course Completion of MATH 25 and Course Completion of MATH 58; or Qualifying Placement from Math Assessment.
See Student Success & Assessment Services (assessment.santarosa.edu) for more information about the assessment process.
Recommended: Course Completion of MATH 1A
Limits on Enrollment:
Transfer Credit: CSU;UC.
Repeatability: Two Repeats if Grade was D, F, NC, or NP

ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:

AS Degree:	**Area**		Effective:	Inactive:
	B	Communication and Analytical Thinking	Fall 2001	
	MC	Math Competency	Fall 1981	
CSU GE:	**Transfer Area**		Effective:	Inactive:
	B4	Math/Quantitative Reasoning	Fall 2001	
IGETC:	**Transfer Area**		Effective:	Inactive:
	2A	Mathematical Concepts & Quantitative Reasoning	Fall 2001	

CSU Transfer:	Transferable	Effective:	Fall 2001	Inactive:
UC Transfer:	Transferable	Effective:	Fall 2001	Inactive:

CID:

Certificate/Major Applicable:
Major Applicable Course

COURSE CONTENT

Outcomes and Objectives:
Upon successful completion of the course, students will be able to:
1. Properly structure mathematical algorithms and proofs.
2. Prove theorems by induction.
3. Apply algorithms from elementary number theory.
4. Use set theory to solve mathematical problems.
5. Apply combinatorics to counting problems, including use of Pigeonhole Principle, permutations, combinations, and probability.
6. Analyze functions, inverse functions, and finite state automata.
7. Solve recurrence relations.
8. Analyze the efficiency of algorithms.
9. Recognize relations and their properties.
10. Use graph theory to develop and analyze appropriate models.

Topics and Scope:

I. Logic

A. Logical form and equivalence
B. Conditional statements
C. Valid and invalid arguments
D. Predicates
E. Quantified statements
F. Arguments with quantified statements

II. Elementary Number Theory and Proofs
A. Direct proofs
B. Counterexamples
C. Rational numbers
D. Divisibility
E. Floor and ceiling functions
F. Proofs by contradiction
G. Proofs by contraposition
H. Algorithms

III. Mathematical Induction
A. Sequences
B. Weak and strong induction
C. Well ordering principle
D. Correctness of algorithms

IV. Combinatorics
A. Counting
B. Probability
C. Possibility trees
D. Multiplication rule
E. Addition rule
F. Inclusion/exclusion
G. Permutations
H. Combinations
I. Counting of multisets

V. Set Theory
A. Definitions
B. Binary operations
C. Properties
D. Partitions
E. Power sets
F. Boolean algebras

VI . Functions
A. Definition
B. One-to-one, onto, and inverse functions
C. Finite state automata
D. Formal languages
E. Composition of functions

VII. Recursion
A. Sequences defined recursively
B. Solving recurrence relations by iteration
C. Solutions of second-order linear homogeneous recurrence relations with constant coefficients

VIII. Algorithm Efficiency
A. Comparison of real valued functions and their graphs
B. O-notation
C. Calculations of efficiency

IX. Relations
A. Relations on sets
B. Reflexivity
C. Symmetry
D. Transitivity
E. Equivalence relations
X. Graph Theory
A. Definitions
B. Paths and circuits
C. Trees

Assignment:

1. Reading assignments (0-50 pages per week).
2. Homework assignments (15-30) consisting of 5-35 problems from required text(s) or supplementary materials chosen by the instructor.
3. Exams (2-6) including final exam, and quizzes (0-8).
4. Projects (0-2): research papers on a specific topic (5-10 pages) or presentations given as posters or short talks. Papers and presentations must be related to topics taught in the course.

Methods of Evaluation/Basis of Grade:

Writing: Assessment tools that demonstrate writing skills and/or require students to select, organize and explain ideas in writing.

None, This is a degree applicable course but assessment tools based on writing are not included because problem solving assessments are more appropriate for this course.	Writing 0 - 0%

Problem Solving: Assessment tools, other than exams, that demonstrate competence in computational or non-computational problem solving skills.

Homework problems	Problem solving 5 - 20%

Skill Demonstrations: All skill-based and physical demonstrations used for assessment purposes including skill performance exams.

None	Skill Demonstrations 0 - 0%

Exams: All forms of formal testing, other than skill performance exams.

Problem solving exams, objective exams and quizzes	Exams 70 - 95%

Other: Includes any assessment tools that do not logically fit into the above categories.

Projects	Other Category 0 - 10%

Representative Textbooks and Materials:
Discrete Mathematics With Applications (4th ed.). Epp, Susanna S. Brooks/Cole Cengage Learning: 2011.
Discrete Mathematics (7th ed.). Johnsonbaugh, Richard. Prentice Hall: 2009.