GAVILAN COLLEGE
5055 Santa Teresa Blvd
Gilroy, CA 95023

Course Outline

COURSE: MATH 16 DIVISION: 10 ALSO LISTED AS:

TERM EFFECTIVE: Fall 2018 CURRICULUM APPROVAL DATE 10/8/2019

SHORT TITLE: Discrete Math

LONG TITLE: Discrete Mathematics

Units	Number of Weeks	Type	Contact Hours/Week	Total Contact Hours
4	18	Lecture:	4	72
		Lab:	0	0
		Other:	0	0
		Total:	4	72

COURSE DESCRIPTION:

Presents discrete mathematical systems including methods of proof that shape the foundations of computer science. Includes propositional logic, set and number theory, Boolean Algebra, deductive and inductive proof, functions and relations, combinatorics, discrete probability, graph theory and network models, and efficiency of algorithms. PREREQUISITE: Mathematics 8B with a grade of 'C' or better or equivalent skills. ADVISORY: CSIS 5 or CSIS 45 with a grade of 'C' or better or equivalent skills.

PREREQUISITES:

Completion of MATH 8B, as UG, with a grade of C or better.

COREQUISITES:

CREDIT STATUS: D - Credit - Degree Applicable

GRADING MODES

L - Standard Letter Grade

REPEATABILITY: N - Course may not be repeated

SCHEDULE TYPES:

02 - Lecture and/or discussion

STUDENT LEARNING OUTCOMES:

1. Evaluate the truth and falsity of mathematical statements employing deductive and inductive proof techniques.

Measure of assessment

Homework, quiz, exam, project.

Year assessed, or planned year of assessment

2019, Fall

2. Analyze the relationships among counting techniques (combinatorics), discrete probability, sets, Boolean algebra, and propositional logic.

Measure of assessment

Homework, quiz, exam, project.

Year assessed, or planned year of assessment

2019, Fall

3. Evaluate graphs, trees, and networks in terms of efficiency, redundancy, and similarity.

Measure of assessment

Homework, quiz, exam, project.

Year assessed, or planned year of assessment 2019, Fall

CONTENT, STUDENT PERFORMANCE OBJECTIVES, OUT-OF-CLASS ASSIGNMENTS

Curriculum Approval Date 10/8/2019

1. HOURS: 8

Logic and Proof: Logical form and equivalence, conditional statements, logical implication, valid and invalid arguments, predicates and quantified statements, arguments with quantified statements.

Performance Objectives: Construct statements and nonstatements, compound statements, apply DeMorgan's Laws. Set up truth tables, logical equivalences and tautologies. Use variations of IF and contrapositive statements.

Out-of-Class Assignments: Students will complete homework assignments which require them to explain, apply, and explore concepts taught in class.

2. HOURS: 8

Number theory and methods of proof: Direct proof and counterexamples, argument by contradiction and contraposition, rational numbers, divisibility, floor/ceiling, algorithm applications.

Performance Objectives: Construct proofs and counter examples. Apply the principles of mathematical induction, direct and indirect deductive methods of proof to explore integers, rationals, and real numbers, and their relationship.

Out-of-Class Assignments: Students will complete homework assignments which require them to explain, apply, and explore concepts taught in class.

3. HOURS: 8

Sequences and mathematical induction: Types and uses of sequences, mathematical induction on sequences, divisibility and proof in inequalities, strong mathematical induction and the Well-Ordering Principle, correctness of algorithms.

Performance Objectives: Use the properties of sequences. Use mathematical induction for proving theories. Use the Well-Ordering Principle for proofs.

Out-of-Class Assignments: Students will complete homework assignments which require them to explain, apply, and explore concepts taught in class.

4. HOURS: 8

Set theory and Boolean Algebra: Basic definitions and properties of set theory, countable and uncountable sets; the empty set, partitions, and power sets; Boolean Algebra; Russell's Paradox.

Performance Objectives: Use set operations and set proofs. Use empty sets, partitions, and power sets for proofs. Illustrate functional similarities of set theory, discrete probability, propositional logic, Boolean algebra, and digital circuits.

Out-of-Class Assignments: Students will complete homework assignments which require them to explain, apply, and explore concepts taught in class.

5. HOURS: 8

Counting and Probability: Counting, possibility trees and the product rule, principle of inclusion and exclusion, counting elements of disjoint sets, counting subsets of a set, combinations/permutations, Pigeonhole Principle, Pascal's Triangle, Binomial Theorem, probability axioms, expected value, conditional probability, Bayes' Theorem, Independence, Chebyshev's Inequality.

Performance Objectives: Use the rules for counting in solving problems. Use the product rule to determine counts. Use the addition rule for disjoint sets and combination rule for subsets. Identify and solve discrete probability and combinatorial problems.

Out-of-Class Assignments: Students will complete homework assignments which require them to explain, apply, and explore concepts taught in class.

6. HOURS: 8

Functions: Functions defined on general sets, finite differences, finite-state automata, one-to-one and onto, inverse functions, composition of functions.

Performance Objectives: Use the rules of finite-state automata to solve problems. Use the one-to-one and onto properties to solve problems. Use composition with functions.

Out-of-Class Assignments: Students will complete homework assignments which require them to explain, apply, and explore concepts taught in class.

7. HOURS: 4

Recursion: Recursively defined sequences, Stirling numbers, solving recurrence relations by iterations.

Performance Objectives: Use recurrence relations to solve problems. Use iteration to solve recurrence problems. Provide recursive, iterative and explicit solutions to discrete mathematical problems.

Out-of-Class Assignments: Students will complete homework assignments which require them to explain, apply, and explore concepts taught in class.

8. HOURS: 4

Relations: Relations on sets; reflexivity, symmetry, and transitivity; equivalence and partial order relations.

Performance Objectives: Use relation theorems on sets and subsets to solve problems. Use reflexivity, symmetry, and transitivity to solve problems. Identify and solve recurrence relations including equivalence relations and partial orderings.

Out-of-Class Assignments: Students will complete homework assignments which require them to explain, apply, and explore concepts taught in class.

9. HOURS: 8

Graphs and Trees: Graphs, Eulerian and Hamiltonian paths and circuits, chromatic and planar graphs, matrix representation of graphs, isomorphism, trees and spanning trees.

Performance Objectives: Use graphs, trees, paths and circuits to solve problems. Create and search Eulerian and Hamiltonian graphs. Create and manipulate trees and spanning trees to find their minimized forms. Apply graph theory and principles of combinatorial analysis to network models.

Out-of-Class Assignments: Students will complete homework assignments which require them to explain, apply, and explore concepts taught in class.

10. HOURS: 8

Efficiency of Algorithms: Real-valued, exponential, and logarithmic functions; Big-O, big-Omega, and big-Theta notation of real-valued functions.

Performance Objectives: Compare the efficiency of common sorting and searching algorithms in terms of big-O, big-Omega, and big-Theta notation. Use real-valued, exponential, and logarithmic functions to graph values.

Out-of-Class Assignments: Students will complete homework assignments which require them to explain, apply, and explore concepts taught in class.

HOURS: 2

Final exam.

METHODS OF INSTRUCTION:

Instruction will follow a standard lecture/discussion format. Extensive homework will be assigned in order to assure mastery of the concepts covered in class. Students will also be required to utilize technology to enhance their understanding of the material. Students will be given opportunities to work together on problems given in class and group projects.

OUT OF CLASS ASSIGNMENTS:

Required Outside Hours: 144

Assignment Description: 1. Regularly assigned homework that requires students to analyze and study pertinent text material, solved examples and lecture notes.

2. Regularly assigned homework that requires students to apply the principles and skills covered in class by solving related problems.

METHODS OF EVALUATION:

Writing assignments

Percent of total grade: 10.00 %

Out-of-class projects.

Problem-solving assignments

Percent of total grade: 10.00 %

Out-of-class projects.

Objective examinations

Percent of total grade: 80.00 %

In-class written exams.

REPRESENTATIVE TEXTBOOKS:

Susanna Epp. Discrete Mathematics with Applications. Brooks/Cole,2019.

ISBN: ISBN-13: 978-1337694193 ISBN-10: 1337694193

Reading Level of Text, Grade: 12 Verified by: Jennifer Nari

Recommended Representative Textbooks

Kenneth Rosen. Discrete Mathematics and Its Applications. McGraw-Hill,2011.

ISBN: ISBN-10: 0073383090 ISBN-13: 978-0073383095

Reading Level of Text, Grade: 12 Verified by: Jennifer Nari

ARTICULATION and CERTIFICATE INFORMATION

Associate Degree:
CSU GE:
IGETC:
CSU TRANSFER:
Transferable CSU, effective 201870
UC TRANSFER:
Not Transferable

SUPPLEMENTAL DATA:

Basic Skills: N
Classification: Y
Noncredit Category: Y
Cooperative Education:
Program Status: 1 Program Applicable
Special Class Status: N
CAN:
CAN Sequence:
CSU Crosswalk Course Department:
CSU Crosswalk Course Number:
Prior to College Level: Y
Non Credit Enhanced Funding: N
Funding Agency Code: Y
In-Service: N
Occupational Course: E
Maximum Hours: 4
Minimum Hours: 4
Course Control Number: CCC000592762
Sports/Physical Education Course: N
Taxonomy of Program: 170100