NAPA VALLEY COLLEGE

COMS 218 - Discrete Structures Course Outline

Approval Date: 03/11/2021
Effective Date: 08/13/2021

SECTION A

Unique ID Number	CCC000623853
Discipline(s)	Computer Science Mathematics
Division	Career Education and Workforce Development
Subject Area	Computer Studies
Subject Code	COMS
Course Number	218
Course Title	Discrete Structures
TOP Code/SAM Code	0706.00 - Computer Science / E - Non-Occupational
Rationale for adding this course to the curriculum	Discrete Math is a required course in the Computer Science ADT
Units	3
Cross List	*N/A*
Typical Course Weeks	18

Total Instructional Hours

	Contact Hours
Lecture	54.00
Lab	0.00
Activity	0.00
Work Experience	0.00
Outside of Class Hours	108.00
Total Contact Hours	0.00
Total Student Hours	108

Open Entry/Open Exit	No
Maximum Enrollment	30
Grading Option	Letter Grade or P/NP

Distance Education Mode of Instruction	On-Campus Hybrid Entirely Online Online with Proctored Exams

SECTION B

General Education Information:

SECTION C

Course Description

Repeatability	May be repeated 0 times
Catalog Description	This course will introduce the discrete structures used in Computer Science, with an emphasis on their applications. Topics covered include: Functions, Relations and Sets; Basic Logic; Proof Techniques; Basics of Counting; Graphs and Trees; and Discrete Probability.
Schedule Description	

SECTION D

Condition on Enrollment

1a. Prerequisite(s)

- COMS 215

1b. Corequisite(s): *None*

1c. Recommended

- MATH 108

1d. Limitation on Enrollment: *None*

SECTION E

Course Outline Information

1. Student Learning Outcomes:

A. Explain the relationship between mathematical induction and recursion/recurrence equations, and their relationship to computing systems.

2. Course Objectives: Upon completion of this course, the student will be able to:

A. Describe how formal tools of symbolic logic are used to model real-life situations, including those arising in computing contexts such as program correctness, database queries, and algorithms
B. Apply the binomial theorem to independent events and Bayes' theorem to dependent events.
C. Demonstrate different traversal methods for trees and graphs.
D. Analyze a problem to create relevant recurrence equations.
E. Relate the ideas of mathematical induction to recursion and recursively defined structures.
F.

3. Course Content

A. Functions, Relations and Sets
    a. Functions (surjections, injections, inverses, composition)
    b. Relations (reflexivity, symmetry, transitivity, equivalence relations)
    c. Sets (Venn diagrams, complements, Cartesian products, power sets)
    d. Pigeonhole principles
    e. Cardinality and countability

B. Basic Logic
  a. Propositional logic
  b. Logical connectives
  c. Truth tables
  d. Normal forms (conjunctive and disjunctive)
  e. Validity
  f. Predicate logic
  g. Universal and existential quantification
  h. Modus ponens and modus tollens
  i. Limitations of predicate logic
C. Proof Techniques
  a. Notions of implication, converse, inverse, contrapositive, negation, and contradiction
  b. The structure of mathematical proofs
  c. Direct proofs
  d. Proof by counterexample
  e. Proof by contradiction
  f. Mathematical induction
  g. Strong induction
  h. Recursive mathematical definitions
  i. Well orderings
D. Basics of Counting
  a. Counting arguments
  b. Sum and product rule
  c. Inclusion-exclusion principle
  d. Arithmetic and geometric progressions
  e. Fibonacci numbers
  f. The pigeonhole principle
  g. Permutations and combinations
  h. Basic definitions
  i. Pascal's identity
  j. The binomial theorem
  k. Solving recurrence relations
  l. Common examples
  m. The Master theorem
E. Graphs and Trees
  a. Trees
  b. Undirected graphs
  c. Directed graphs
  d. Spanning trees/forests
  e. Traversal strategies
F. Discrete Probability
  a. Finite probability space, probability measure, events
  b. Conditional probability, independence, Bayes' theorem
  c. Integer random variables, expectation
  d. Law of large numbers
  e.

4. Methods of Instruction:

Activity: The student will analyze a problem to create relevant recurrence equations.
Lecture: The instructor will teach the student how to relate the ideas of mathematical

induction to recursion and recursively defined structures.

Projects:

Online Adaptation: Discussion

1. Methods of Evaluation: Describe the general types of evaluations for this course and provide at least two, specific examples.

Typical classroom assessment techniques

Exams/Tests --

Quizzes -- The student will be quizzed on the different traversal methods for trees and graphs.

Home Work -- Students will describe how formal tools of symbolic logic are used to model real-life situations, including those arising in computing contexts such as program correctness, database queries, and algorithms.

Final Exam -- In the final exam, the student will apply the binomial theorem to independent events and Bayes? theorem to dependent events

Letter Grade or P/NP

2. Assignments: State the general types of assignments for this course under the following categories and provide at least two specific examples for each section.

A. Reading Assignments
Read Section 9.4 on the Pigeonhole Principle.

B. Writing Assignments
For Section 4.2 on Direct Proof and Counterexample: Divisibility, complete problems 1-31.

C. Other Assignments

D.

3. Required Materials

A. EXAMPLES of typical college-level textbooks (for degree-applicable courses) or other print materials.

Book #1:	
Author:	Epp, Susanna
Title:	Discrete Mathematics with Applications
Publisher:	Cengage
Date of Publication:	2019
Edition:	5th

B. Other required materials/supplies.