

Competency: 020V Discrete Mathematics	
Element 1: To apply concepts of set theory and logic	
<p><u>Performance Criteria</u></p> <p>1.1 Appropriate use of concepts</p> <p>1.2 Appropriate use of Boolean algebra to design a logical circuit</p>	<p><u>Learning Outcomes</u></p> <p>The student will be able to:</p> <ul style="list-style-type: none"> • Demonstrate understanding of set terminology, universal quantifiers, and logical equivalences. • Apply notions of sets and logic to truth tables, De Morgan Law, logic gates, and logic functions. • Implement Boolean logic to simplify and/or draw a logic circuit.
Element 2: To develop the steps of a simple mathematical proof	
<p><u>Performance Criteria</u></p> <p>2.1 Correct choice and application of proof techniques</p>	<p><u>Learning Outcomes</u></p> <p>The student will be able to:</p> <ul style="list-style-type: none"> • Determine the various type of proving techniques available in a given situation (direct, contra-positive, contradiction, induction). • Analyze and choose the most appropriate technique to prove a particular statement.
Element 3: To apply the rules of concepts of modular arithmetic and number systems	
<p><u>Performance Criteria</u></p> <p>3.1 Correct use of Euclid’s algorithm and modular arithmetic</p> <p>3.2 Correct conversion of integers between different bases</p>	<p><u>Learning Outcomes</u></p> <p>The student will be able to:</p> <ul style="list-style-type: none"> • Know the binary representation of integers. • Perform operations in binary. • Apply Euclidean Algorithm and solve equations in modular arithmetic. • Use modular arithmetic in basic cryptography. • Use the complex numbers (optional).

Element 4: To use the elementary principles of enumeration	
<u>Performance Criteria</u> 4.1 Accurate use of counting formulas for problem solving	<u>Learning Outcomes</u> The student will be able to: <ul style="list-style-type: none"> • Apply multiplication rule in counting. • Appropriate use of permutations and combinations in counting. • State and use the Binomial Theorem. • State and use Pigeonhole Principle.
Element 5: To define a recurrence function	
<u>Performance Criteria</u> 5.1 Appropriate use of concepts	<u>Learning Outcomes</u> The student will be able to: <ul style="list-style-type: none"> • Apply recurrence relations to the analysis of algorithms.
Element 6: To find the solution of a function defined by a second order linear recurrence equation	
<u>Performance Criteria</u> 6.1 Accurate solution of a second order linear recurrence equation	<u>Learning Outcomes</u> The student will be able to: <ul style="list-style-type: none"> • Solve linear recurrence of first and second degree.
Element 7: To draw graphs to represent a situation.	
<u>Performance Criteria</u> 7.1 Correct determination and use of a graph's adjacency matrix	<u>Learning Outcomes</u> The student will be able to: <ul style="list-style-type: none"> • Appropriate knowledge of graph related terminology. • Be able to define simple, directed, non-directed, Hamiltonian, Eulerian, and weighted graphs. • Define and work with cycles in paths • Travelling salesperson problem. • Carry out the Shortest Path algorithm. • Define and use adjacency and incident matrices of a graph.