

## 2. COMPUTING CORE COURSES

<b>Course Title</b>	<b>Discrete Structures</b>
<b>Course Code</b>	<b>CC-111</b>
<b>Credit Hours</b>	3
<b>Category</b>	Computing Core
<b>Prerequisite</b>	None
<b>Co-Requisite</b>	None
<b>Follow-up</b>	None
<b>Course Description</b>	<p><b>Mathematical Reasoning:</b> Propositional and predicate logic. <b>Propositional Logic:</b> Logical operators, translations between symbolic expressions and formal English expression, logical equivalences. <b>Predicate Logic:</b> Quantifiers, Nested quantification, equivalences, translations between symbolic forms and formal English. <b>Rules of Inference:</b> Proof methods and strategies, Direct proof, Proof by contraposition, proof by induction, proof by implication, Existence proof, Uniqueness proofs, trivial proofs, vacuous proofs. <b>Sets:</b> Notations, set operations, Venn diagrams, countable and uncountable sets, relations, equivalence relations and partitions, partial orderings, recurrence relations, functions, mappings. <b>Functions:</b> Injective, surjective, bijective, special types of functions, function composition, inverse functions, recursive functions, compositions, number theory, sequences, series, counting, inclusion and exclusion principle, pigeonhole principle, permutations and combinations. <b>Integers and Divisibility:</b> Division theorem, modular arithmetic, LCM, GCD, Euclidean and Extended Euclidean method, finding solutions to congruence. <b>Primes:</b> Fundamental theorem of arithmetic, characterizations of primes, Mersenne primes. <b>Induction:</b> Weak induction, strong induction. <b>Recursion and Recurrences:</b> Formulation of recurrences, closed formulas, <b>Counting:</b> product rule, sum rule, principle of inclusion-exclusion, combinations and permutations, binomial coefficients, Pascal's identity and Pascal's triangle, binomial theorem, pigeonhole principle. <b>Relations:</b> Reflexive, symmetric, transitive, antisymmetric, equivalence relations and equivalence classes, partial orders. <b>Graph Theory:</b> Terminologies, elements of graph theory, planar graphs, graph coloring, Euler graph, Hamiltonian path, rooted trees, traversals, handshaking lemma and corollary, special families of graphs, isomorphism, planarity, Eulerian and Hamiltonian graphs, trees.</p>
<b>Text Book(s)</b>	1. Kenneth H. Rosen, Discrete Mathematics and Its Applications, 7 <sup>th</sup> Edition, McGraw Higher-Ed, 2011, ISBN: 0073383090.
<b>Reference Material</b>	<ol style="list-style-type: none"> <li>1. Susanna S. Epp, Discrete Mathematics with Applications, 4th Edition.</li> <li>2. Richard Johnson Baugh, Discrete Mathematics, 7th Edition.</li> <li>3. Kolman, Busby &amp; Ross, Discrete Mathematical Structures, 4th Edition.</li> <li>4. Ralph P. Grimaldi, Discrete and Combinatorial Mathematics: An Applied Introduction, 5th Edition.</li> <li>5. Winifred Grassman, Logic and Discrete Mathematics: A Computer Science Perspective, 1st Edition.</li> </ol>